(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
26 March 2009 (26.03.2009)

PCT

(10) International Publication Number
WO 2009/039391 A1

(51) International Patent Classification:
G06Q 10/00 (2006.01)

(21) International Application Number:
PCT/US2008/077046

(22) International Filing Date:
19 September 2008 (19.09.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/974,238 21 September 2007 (21.09.2007) US

(71) Applicant *(for all designated States except US)*: **THE METHODIST HOSPITAL SYSTEM** [US/US]; 6565 Fannin, Suite D-200, Houston, TX 77030 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **BUTLER, Edward, Brian** [US/US]; 6632 Rutgers, Houston, TX 77005 (US). **FISCHER, Craig, Peter** [US/US]; 3314 Lake Street, Houston, TX 77098 (US).

(74) Agent: **MATTINGLY, Todd, D.**; Bracewell & Giuliani LLP, P.O. Box 61389, Houston, TX 77208-1389 (US).

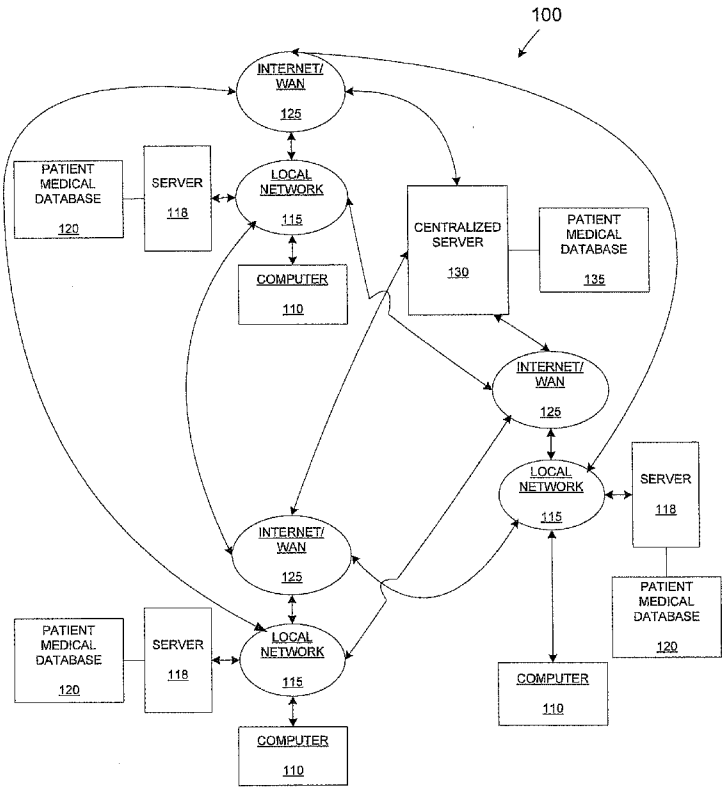
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,

[Continued on next page]

(54) Title: SYSTEMS, METHODS AND APPARATUSES FOR GENERATING AND USING REPRESENTATIONS OF INDIVIDUAL OR AGGREGATE HUMAN MEDICAL DATA

FIG. 1



(57) Abstract: Systems, methods, and apparatuses for generating and using representations of individual or aggregate human medical data Invention includes a computer system comprising a processor, a database that stores a plurality of patient medical data, a virtual patient module, and a device to display an image of the virtual patient to a user.

WO 2009/039391 A1

FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

SYSTEMS, METHODS AND APPARATUSES FOR GENERATING AND USING REPRESENTATIONS OF INDIVIDUAL OR AGGREGATE HUMAN MEDICAL DATA

CROSS REFERENCE TO RELATED APPLICATIONS

The present application claims the benefit of the filing date of U.S. provisional patent application serial no. 60/974,238, filed on 9/21/2007, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

This invention relates to computer generated representations of individual or aggregate human medical data.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 illustrates a schematic view of a network system for an exemplary embodiment;

Figure 2 illustrates a block diagram of a computer system for an exemplary embodiment;

Figure 3 illustrates a diagram of a patient medical database for an exemplary embodiment;

Figure 4 illustrates a block diagram of at least one processor engine within the computer system for an exemplary embodiment;

Figure 5 illustrates a flowchart of a method for generating and displaying a representation of individual or aggregate human medical data for an exemplary embodiment;

Figure 6A illustrates three cross sections of an anatomical structure for an exemplary embodiment;

Figure 6B illustrates the first cross section of the anatomical structure shown in Figure 6A for an exemplary embodiment;

Figure 6C illustrates the second cross section of the anatomical structure shown in Figure 6A for an exemplary embodiment;

Figure 6D illustrates the third cross section of the anatomical structure shown in Figure 6A for an exemplary embodiment;

Figure 7 illustrates a perspective view of a representation of individual or aggregate human medical data having a highlighted anatomical structure for an exemplary embodiment;

Figure 8 illustrates a flowchart of a method for generating and displaying a representation of individual or aggregate human medical data, wherein a pointer is used to display at least one patient medical data for an exemplary embodiment;

Figure 9 illustrates a perspective view of a representation of individual or aggregate human medical data having at least one distinguishable anatomical structure with a pointer located on top of the distinguishable anatomical structure for an exemplary embodiment;

Figure 10 illustrates a flowchart of a method for generating and displaying a representation of individual or aggregate human medical data, wherein a pointer is used to access at least one patient medical data for an exemplary embodiment;

Figure 11 illustrates a pictorial view of a display screen showing accessible patient medical data for an exemplary embodiment;

Figure 12 illustrates a flowchart of a method for generating and displaying a representation of individual or aggregate human medical data, wherein additional patient medical data stored at a remote location is accessed via a communications device for an exemplary embodiment;

Figure 13 illustrates a flowchart of a method for generating and displaying a representation of individual or aggregate human medical data, wherein additional patient medical data is accessible from a website via a communications device and the medical provider may upload additional patient medical data for an exemplary embodiment;

Figure 14A illustrates a screenshot of a graphical user interface for an exemplary embodiment;

Figure 14B illustrates a screenshot of a graphical user interface for an exemplary embodiment;

Figure 14C illustrates a screenshot of a graphical user interface for an exemplary embodiment;

Figure 14D illustrates a screenshot of a graphical user interface for an exemplary embodiment;

Figure 14E illustrates a screenshot of a graphical user interface for an exemplary embodiment;

Figure 15 illustrates a flowchart of a method for generating and displaying a representation of individual or aggregate human medical data, wherein the representation may be used for simulating surgery for an exemplary embodiment;

Figure 16 illustrates a perspective view of a representation of individual or aggregate human medical data showing a surgical tool and a positioning locator device comprising a scope for an exemplary embodiment;

Figure 17 illustrates a flowchart of a method for generating and displaying a representation of individual or aggregate human medical data, wherein the representation may be used for performing surgery for an exemplary embodiment; and

Figure 18 illustrates a flowchart of a method for generating and displaying a representation of individual or aggregate human medical data for an exemplary embodiment.

Figs. 19a and 19b are illustrations of an exemplary embodiment of a dynamic graphical user interface.

Fig. 20 is a flow chart illustration of an exemplary embodiment of a method for identifying anatomical structures in a CT scan.

Fig. 21 is an illustration of an exemplary embodiment of a CT scan processed in accordance with the method of Fig. 20.

DETAILED DESCRIPTION OF THE INVENTION

Medical providers are continuously searching for ways to improve the service they provide to their patients. In today's medical provider-patient relationship, it is important for medical providers to have access to prior and recent medical information located at their own facility as well as remote facilities, to have access to a variety of tools in aiding the diagnosis and treatment of their patient's ailments, and to have patients be involved in their own treatment and well-being.

Figure 1 illustrates a schematic view of a network system used for an exemplary embodiment. The network system **100** comprises multiple computers **110** located at remote areas that may each be connected to one or more local networks **115**. Each local network **115** may be connected to a server **118** having a corresponding patient medical database **120**. The computer **110** may also be connected to the internet/WAN **125** via a communications device (not shown) so that the computer **110** may connect to other remote local networks **115** for accessing the patient medical database **120** associated with that remote local network **115**. This access ensures that the medical provider will have a greater amount of patient medical data so as to improve diagnosis and treatment. In an exemplary embodiment, there may also be a centralized server **130** having at least one centralized patient medical database **135**. It is envisioned that the at least one centralized patient medical database **135** may store the entire patient medical data for a specific patient, wherein medical providers may upload scans, diagnostic results and any other medically related information. This network system **100** may help prevent or reduce the amount of duplicative diagnostic tests being performed and thereby reduce healthcare costs. Each computer **110** having access to the internet/WAN **125** may also have access to these remote local networks **115** and/or the centralized server **130** with the proper passwords.

Although Fig. 1 illustrates a full network system **100** comprising of multiple computers **110**, local networks **115** connected to the server **118** having the corresponding patient medical database **120**, a communications device for

connecting to remote local networks **115** and the centralized server **130** comprising at least one centralized patient medical database **135**, it should be understood that the computer **110** may generate a representation of individual or aggregate human medical data independent of the network system **100** without departing from the scope and spirit of the exemplary embodiment. This representation may include, but is not limited to, images, documents, charts and graphs. It should also be understood that that the communications device used for accessing the internet/WAN **125** may connect only to the centralized server **130** or only to other remote local networks **115**, without departing from the scope and spirit of the exemplary embodiment. Further, it should be understood that a computer **110** not connected to a local network **115** may access remote local networks **115** and/or the centralized server **130** via a communications device capable of accessing the internet/WAN **125** without departing from the scope and spirit of the exemplary embodiment.

As shown in Figure 2, an exemplary embodiment disclosed hereinbelow describes a representation of individual or aggregate human medical data generation system **210** specifically designed to generate a representation of individual or aggregate human medical data image **220** that comprises a representation of one or more anatomical structures for a particular patient and the approximate location of the one or more anatomical structures with respect to the other anatomical structures. The representation of individual or aggregate human medical data generation system **210** comprises a patient medical database **120**, a processor **230**, a network **115**, a user interface **240**, and a display **250**.

Figure 3 illustrates a diagram of a patient medical database for an exemplary embodiment. The patient medical database **120** comprises at least one patient medical data **310** for at least one patient. The patient medical data **310** may be categorized within one or more categories comprising blood tests, cardio scans, EKG, CT scans, x-rays, PET scans, patient history, presenting symptoms, phenotype information, demographic information, biometric information, specific tumor markers and genetic profile. It should be understood that although the categories have been listed as comprising blood tests, cardio scans, EKG, CT scans, x-rays, PET scans, patient history, presenting symptoms, phenotype

information, demographic information, biometric information, specific tumor markers and genetic profile, other results obtained from any diagnostic test may also be included as a category for the at least one patient medical data **310** without departing from the scope and spirit of the exemplary embodiment. This at least one patient medical data **310** may be normalized in the patient medical database **120** so that it may be accessed, used and/or manipulated by a common set of applications. This at least one patient medical data **310** may be used for generating the representation of individual or aggregate human medical data that is specific to the patient. Additionally, the phenotype information may be linked to the genetic profile thereby creating a genetic map.

The patient medical database **120** may be organized such that the at least one patient medical data **310** is associated with one or more categories comprising a patient name **315**, a date **320**, a data type **325**, a diagnostic scan type **330** and a related anatomical structure **335**. It is envisioned that the at least one patient medical data **310** may be associated with alternative categories without departing from the scope and spirit of the exemplary embodiment. Furthermore, the at least one patient medical data **310** may be primarily sortable via the patient name **315**, the date **320**, the data type **325**, the diagnostic scan type **330** or the related anatomical structure **335** and additionally sortable via any one of the remaining associated categories. As illustrated in Fig. 3, the at least one patient medical data **310** is primarily sorted alphabetically via the patient name **315** and secondarily sorted via the date **320** from the most recent to the oldest.

The patient name **315** comprises the full patient name including first name, last name and middle name. It should be understood that although this embodiment depicts the patient name comprising the full patient name, the patient name may comprise any patient identifying information, including social security number or patient number, without departing from the scope and spirit of the exemplary embodiment.

The date **320** comprises the date that the at least one patient medical data **310** was obtained or analyzed. The data type **325** indicates the nature of the at least one patient medical data **310**, whether it is an image or a numerical data. The diagnostic scan type **330** further indicates the nature of the at least one patient

medical data **310** by categorizing the at least one patient medical data **310** via blood tests, cardio scans, EKG, CT scans, x-rays, PET scans, patient history, presenting symptoms, phenotype information, demographic information, biometric information, specific tumor markers and genetic profile and/or any other image or numerical data resulting from diagnostic tests. The related anatomical structure **335** indicates the anatomical structure that the at least one patient medical data **310** relates to. It should be understood that the terms used in Fig. 3 are only representative terms, but that any term, i.e. picture or scan in lieu of image, may be used without departing from the scope and spirit of the exemplary embodiment.

The patient medical database **120** may also comprise an anatomical data set **340**, which is a library of anatomical data that may be used for identifying and labeling the at least one anatomical structures obtained from a scan of a specific patient. The patient medical database **120** may also comprise a population medical data **350** associated with a population low range **354** and a population high range **356**. This population medical data **350** may be used for comparing with actual patient medical data **310** and identifying anatomical structures that have associated data that fall below the population low range **354** or above the population high range **356**. Although this embodiment uses the population low range **354** and the population high range **356** for determining abnormal patient medical data, other methods may be used, e.g. using a standard deviation of approximately two (2) from the population normal or average.

The patient medical database **120** may also comprise at least one hereditary trait **360** for the specific patient. Furthermore, the patient medical database **120** may comprise a recommended diagnostic test **362** that is associated with the at least one hereditary trait and the at least one patient medical data **310**. The patient medical database **120** may also comprise a list of diagnosis **365** for assisting the medical provider in properly diagnosing the patient's ailment. The patient medical database **120** may further comprise a best plan of care **370** for assisting the medical provider in determining the proper treatment. Although not illustrated in Fig. 3, the patient medical database **120** may also comprise categories including phenotypic information, patient history and presenting symptoms. It should be understood that

the patient medical database **120** may comprise more or less information without departing from the scope and spirit of the exemplary embodiment.

Figure 4 illustrates a block diagram of at least one processor engine **400** within the computer system for an exemplary embodiment. As shown in this embodiment, the at least one processor engine **400** comprises a data normalizing engine **403**, an anatomical structure detection engine **405**, an anatomical structure labeling engine **410**, a patient medical data association engine **415**, an abnormal patient medical data identification engine **420**, a representation of individual or aggregate human medical data engine **425**, a recommended diagnostic test reminder engine **430**, an evidence based medicine engine **435**, a best plan of care engine **440**, and a risk factors identification engine **445**. The at least one processor engine **400** may be viewed as those engines which assist in generating the representation of individual or aggregate human medical data and those engines which assist the medical provider in diagnosing and treating the patients' ailments.

The processor engines **400** which assist in generating the representation of individual or aggregate human medical data comprise the data normalizing engine **403**, the anatomical structure detection engine **405**, the anatomical structure labeling engine **410**, the patient medical data association engine **415**, the abnormal patient medical data identification engine **420**, and the representation of individual or aggregate human medical data engine **425**. Referring to Figures 3 and 4, the data normalizing engine **403** normalizes the patient medical data **310** such that it may be available to a common set of applications and may store the normalized data within the patient medical database **120**. Thus, whether the data is generated from blood tests, cardio scans, EKG, CT scans, x-rays, PET scans, patient history, presenting symptoms, phenotype information, demographic information, biometric information, specific tumor markers or genetic profile, a variety of applications may make use of the normalized data. The anatomical structure detection engine **405** analyzes a normalized CT scan from the patient medical database **120** and detects the at least one anatomical structure illustrated within the normalized CT scan. The anatomical structure labeling engine **410** compares the at least one anatomical structure illustrated within the normalized CT scan with the anatomical data set **340** stored within the patient medical database **120** to identify and automatically label the at

least one anatomical structure illustrated within the normalized CT scan. The patient medical data association engine **415** associates the appropriate at least one patient medical data **310** to each of the related at least one anatomical structure. The abnormal patient medical data identification engine **420** compares the at least one patient medical data **310** from the patient medical database **120** to the population medical data **350** and identifies at least one patient medical data **310** as being abnormal if the patient medical data **310** either falls below the population low range **354** or above the population high range **356**. The representation of individual or aggregate human medical data engine **425** generates an interactive representations of individual or aggregate human medical data image **220** (Fig. 2) that is specific to the patient and automatically labels the at least one anatomical structure. Hence, the location of each anatomical structure within the representation of individual or aggregate human medical data image **220** (Fig. 2) is an approximate location of each anatomical structure within the actual patient. It should be understood that there may be engines that perform multiple tasks or that there may be multiple engines that perform a single task without departing from the scope and spirit of the exemplary embodiment. Additionally, it should be understood that there may be additional engines used for creating the representation of individual or aggregate human medical data without departing from the scope and spirit of the exemplary embodiment. Furthermore, although the exemplary embodiment illustrates the data normalizing engine to normalize the patient medical data and then store it in the patient medical database, the data normalization may occur while the data is extracted from the patient medical database without departing from the scope and spirit of the exemplary embodiment. Thus, the normalized data is not stored within the patient medical database.

The processor engines **400** which aid the medical provider in diagnosing and treating the patients' ailments comprise the recommended diagnostic test reminder engine **430**, the evidence based medicine engine **435**, the best plan of care engine **440**, and the risk factors identification engine **445.** Referring to Figures 3 and 4, the recommended diagnostic test reminder engine **430** determines the recommended diagnostic tests **362** that should be performed on the patient based upon the hereditary traits **360** and the at least one patient medical data **310** associated with the patient. Additionally, the recommended diagnostic test reminder engine **430**

determines when the recommended diagnostic test **362** should be performed. The evidence based medicine engine **435** reviews at least one possible treatment option and evaluates the risks and benefits for each of the at least one possible treatment option. The evidence based medicine engine **435** also predicts the outcome for each of the at least one possible treatment option. The best plan of care engine **440** reviews the results obtained from the evidence based medicine engine **435** and selects the best plan of care. The risk factors identification engine **445** identifies potential risk factors based upon the at least one patient medical data **310**. It should be understood that there may be engines that perform multiple tasks or that there may be multiple engines that perform a single task without departing from the scope and spirit of the exemplary embodiment. Additionally, it should be understood that there may be additional engines used for assisting the medical provider in diagnosing and treating the patients' ailments without departing from the scope and spirit of the exemplary embodiment.

Figure 5 illustrates a flowchart of a method **500** for generating and displaying a representation of individual or aggregate human medical data for an exemplary embodiment. At step **510**, at least one patient medical data of a patient is obtained. A patient may undergo at least one diagnostic test wherein at least one patient medical data, which comprises a CT scan of at least one anatomical structure, is stored within a patient medical database. As described previously, this patient medical database may be stored locally on the computer hard drive, stored at a remote location, or a combination of being stored locally and remotely. To generate a full bodied representation of individual or aggregate human medical data, a full body CT scan and at least one imaging modality is recommended for being at least one patient medical data.

At step **520**, a representation of individual or aggregate human medical data is generated using the at least one patient medical data, wherein the representation of individual or aggregate human medical data is specific to the patient. The representation of individual or aggregate human medical data is generated by a processor comprising one or more processor engines, which are illustrated in Fig. 4. The engines involved in generating the representation of individual or aggregate human medical data comprise the data normalizing engine, the anatomical structure

detection engine, the anatomical structure labeling engine, and the representation of individual or aggregate human medical data engine. As described previously, the data normalizing engine may normalize the at least one patient medical data either prior to being stored within the patient medical database or at the time of its use. According to this embodiment, the anatomical structure detection engine analyzes a full body CT scan that is stored in the patient medical database and detects the at least one anatomical structure illustrated within the full body CT scan. Although this embodiment uses a full body CT scan to generate the representation of individual or aggregate human medical data, it should be understood that one or more CT scans of a particular anatomical structure may be combined to generate the representation of individual or aggregate human medical data.

There are two methods that the anatomical structure detection engine **405** uses for detecting the at least one anatomical structure illustrated within the CT scan having a one or more cross section images.

The first method involves a grid system **600**, which is illustrated in Figures 6A-6D. The anatomical structure detection engine creates a grid **620** comprising a number of columns by a number of rows for each of the one or more cross section images. Figure 6A illustrates three cross sections of an anatomical structure **630** for an exemplary embodiment. Figure 6B illustrates the first cross section **610** of the anatomical structure **630** shown in Figure 6A for an exemplary embodiment. The anatomical structure **630** is shown as being located in the third column and fourth row. Figure 6C illustrates the second cross section **612** of the anatomical structure **630** shown in Figure 6A for an exemplary embodiment. Again, the anatomical structure **630** is shown as being located in the third column and fourth row. Figure 6D illustrates the third cross section **614** of the anatomical structure **630** shown in Figure 6A for an exemplary embodiment. Again, the anatomical structure **630** is shown as being located in the third column and fourth row. The anatomical structure detection engine detects the anatomical structure **630** because it is located in substantially the same grid location on each of the cross section images **610, 612, 614**. Although the location may change slightly from one cross section to the next cross section, the anatomical structure detection engine keeps track of the distance

and how the anatomical structure **630** moves throughout the one or more cross section images **610, 612, 614**.

The second method that the anatomical structure detection engine **405** may use for detecting the at least one anatomical structure illustrated within the CT scan is by measuring the density units of the various locations across the cross section images. The density units may be measured using Houndsfield units. As the density changes along the cross section images, the anatomical structure detection engine detects the density change and identifies the at least one anatomical structure illustrated within the CT scan. Additionally, the grid method may be used in combination with the density method for ascertaining the relative position of the at least one anatomical structure.

Once the anatomical structure detection engine **405** detects the various anatomical structures, the anatomical structure labeling engine compares the at least one anatomical structure illustrated within the CT scan with the anatomical data set, which is stored within the patient medical database, to identify and label the at least one anatomical structure illustrated.

The representation of individual or aggregate human medical data patient engine generates an interactive representation of individual or aggregate human medical data that is specific to the patient. The location of each anatomical structure within the representation of individual or aggregate human medical data is approximate to the locations of each anatomical structure within the patient.

Additionally, the processor may further comprise the patient medical data association engine **415**. The patient medical data association engine **415** associates the at least one patient medical data located within the patient medical database to each of the related at least one anatomical structure that were identified.

Moreover, the processor may further comprise the abnormal patient medical data identification engine **420**. The abnormal patient medical data identification engine **420** compares the at least one patient medical data from the patient medical database to the population medical data and identifies a portion of the at least one patient medical data as being abnormal if the portion of the at least one patient medical data either falls below the population low range or above the population high

range. As previously discussed, the abnormal patient medical data may be identified by other methods, i.e. if the patient medical data is beyond approximately two (2) standard deviations from the population normal or average.

At step **530**, the representation of individual or aggregate human medical data image is displayed on a device for interaction with a user. Figure 7 illustrates a perspective view of a representation of individual or aggregate human medical data **700** having a highlighted anatomical structure **710** for an exemplary embodiment. The highlighted anatomical structure **710** informs the medical provider that there is at least one abnormal patient medical data associated with that highlighted anatomical structure **710**. The medical provider may then analyze the reasons for the highlighted anatomical structure **710**. As shown in this embodiment, the representation of individual or aggregate human medical data **700** may comprise at least one anatomical structure comprising the brain **720**, the lungs **730**, the aorta **740**, the kidneys **710**, the intestines **750**, and the lymphatic system **760**. Although this embodiment shows only the brain **720**, the lungs **730**, the aorta **740**, the kidneys **710**, the intestines **750**, and the lymphatic system **760**, it should be understood that all anatomical structures may be represented in the representation of individual or aggregate human medical data **700**. Furthermore, although Fig. 7 illustrates the representation of individual or aggregate human medical data in two-dimensions, the representation of individual or aggregate human medical data may also be viewed in three-dimensions. In an alternative embodiment, the representation of individual or aggregate human medical data is displayed in a holographic, three-dimensional view.

Figure 8 illustrates a flowchart of a method **800** for generating and displaying a representation of individual or aggregate human medical data, wherein a pointer is used to display at least one patient medical data for an exemplary embodiment. The method illustrated in steps **810** and **820** in Fig. 8 is identical to the method described above in steps **510** and **520** of Fig. 5. Additionally, at step **830**, the image of the representation of individual or aggregate human medical data is displayed on a device for interaction with a user, wherein the image of the representation of individual or aggregate human medical data comprises at least one distinguishable anatomical structure. Figure 9 illustrates a perspective view of a representation of

individual or aggregate human medical data **900** having at least one distinguishable anatomical structure **940** with a pointer **990** located on top of the distinguishable anatomical structure **940** for an exemplary embodiment. As illustrated in Fig. 9, there are many distinguishable anatomical structures, including the aorta **940**, the brain **920**, the lymphatic system **960**, the kidneys **910**, the lungs **930**, and the intestines **950**. Fig. 9 shows the pointer **990** located on top of the aorta **940** and displaying at least one patient medical data that is associated with the aorta **940**.

Referring back to Fig. 8, at step **840**, the pointer is moved to at least one distinguishable anatomical structure, such that at least one patient medical data is displayed when the pointer is located upon the at least one distinguishable anatomical structure. Fig. 9 shows the pointer **990** moved onto the aorta **940**, wherein the associated current patient medical data **970** is displayed on the display along with the anatomical structure identifier **975** and the date **980** the current medical data **970** is associated with. The patient medical data associated with the aorta is shown to comprise red blood cell count, white blood cell count, cholesterol, platelet count and oxygen level. Although Fig. 9 shows that the red blood cell count, the white blood cell count, the cholesterol, the platelet count and the oxygen level are associated with the aorta, there may be alternative associated patient medical data without departing from the scope and spirit of the exemplary embodiment. In this manner, the method 800 provides a context-sensitive graphical user interface for use by medical professionals throughout the medical treatment of a patient.

Figure 10 illustrates a flowchart of a method **1000** for generating and displaying a representation of individual or aggregate human medical data, wherein a pointer is used to access at least one patient medical data for an exemplary embodiment. The method illustrated in steps **1010, 1020** and **1030** in Fig. 10 are identical to the method described above in steps **810, 820** and **830** of Fig. 8. At step **1040**, a pointer is moved to at least one distinguishable anatomical structure, such that at least one patient medical data is accessible when the pointer is located upon the at least one distinguishable anatomical structure. Fig. 9 shows the pointer **990** moved onto the aorta **940**, wherein the associated current patient medical data **970** is displayed on the display. The patient medical data **970** associated with the aorta **940** is shown to comprise red blood cell count, white blood cell count, cholesterol,

platelet count and oxygen level. When the pointer **990** is clicked on the aorta **940**, a display screen **1100** as shown in Figure 11 appears. Fig. 11 illustrates a pictorial view of the display screen **1100** showing accessible patient medical data **1110** for an exemplary embodiment. This screen illustrates all the accessible patient medical data **1110** that has been associated with the aorta **940** (Fig. 9), comprising blood tests, heart scans, EKGs and CT scans. Although Fig. 11 shows that the blood tests, heart scans, EKGs and CT scans are patient medical data **1110** associated with the aorta, there may be alternative associated patient medical data **1110** without departing from the scope and spirit of the exemplary embodiment. The medical provider may use the pointer **1160** to click on the desired associated patient medical data **1110** to view the detailed results. This associated patient medical data **1110** may be sorted by the type of patient medical data **1110** or by the date. Additionally, Fig. 11 displays the patient identifier **1120** and the selected anatomical structure **1130** on the display screen **1100**.

Figure 12 illustrates a flowchart of a method **1200** for generating and displaying a representation of individual or aggregate human medical data, wherein additional patient medical data stored at a remote location is accessed via a communications device for an exemplary embodiment. The method illustrated in steps **1210, 1230** and **1240** in Fig. 12 is identical to the method described above in steps **510, 520** and **530** of Fig. 5. Additionally, at step **1220**, additional patient medical data of the at least one patient is accessed via a communications device, wherein the additional patient medical data is stored at a remote location. As described in Fig. 1 above, additional patient medical data may be accessed from the plurality of remote local networks **115** and/or the centralized server **130** having the at least one centralized patient medical database **135**.

Figure 13 illustrates a flowchart of a method **1300** for generating and displaying a representation of individual or aggregate human medical data, wherein additional patient medical data is accessible from a website via a communications device and the medical provider may upload additional patient medical data for an exemplary embodiment. The method illustrated in steps **1310, 1330** and **1340** in Fig. 13 is identical to the method described above in steps **510, 520** and **530** of Fig. 5. Additionally, at step **1320**, a website may be accessed via a communications device,

wherein the at least one patient medical data is accessible via the website, and wherein the at least one patient medical data is updatable by a medical provider.

Figures 14A-E illustrates one or more screenshots of a graphical user interface for an exemplary embodiment. This graphical user interface **1400** may reside and be executed on either the local computer or on the website. Figure 14A illustrates one screenshot wherein the user selects either a patient portal **1410** or a medical provider portal **1415**. Once the user selects the desired portal, the screenshot shown in Figure 14B appears so that the user may input user identification information **1420**. This user identification information **1420** may be in the form of a user name and password, social security number, patient identification number or any other identifying information. If the medical provider portal **1415** was selected in the screenshot shown in Fig. 14A, the next screenshot appearing after Fig. 14B may be a patient identification screen **1430** wherein the medical provider inputs information for selecting a particular patient. This input may take the form of a patient ID number **1435**. Fig. 14D illustrates the medical provider main screen **1440** of the medical provider portal **1415**. This screenshot comprises a plurality of links comprising Dicom **1442**, Molecular data **1444**, tumor specifications **1446**, EMR **1447**, Demographics **1448**, evidence based medicine **1450**, best plan of care **1452**, upload additional patient medical data **1454** and view my body **1456**. Fig. 14E illustrates a patient main screen **1470** of the patient portal. This screenshot comprises at least one link comprising view my body **1456**, executive CT **1460**, what are my diseases **1462**, what are my risk factors **1464**, and what is best evidence for my treatment **1466**.

Figure 15 illustrates a flowchart of a method **1500** for generating and displaying a representation of individual or aggregate human medical data, wherein the image of the representation of individual or aggregate human medical data may be used for simulating surgery for an exemplary embodiment. The method illustrated in steps **1510, 1520** and **1530** in Fig. 15 is identical to the method described above in steps **510, 520** and **530** of Fig. 5. Additionally, at step **1540**, surgery is simulated using the image of the representation of individual or aggregate human medical data. Figure 16 illustrates a perspective view of a representation of individual or aggregate human medical data **1600** showing a surgical tool **1620** and a

positioning locator device **1610** comprising a scope **1615** for an exemplary embodiment. The positioning locator device **1610** may be a GPS locator in an exemplary embodiment. Although the positioning locator device **1610** may be a GPS device, any other positioning locator device may be used without departing from the scope and spirit of the exemplary embodiment. The scope **1615** may assist in gathering patient medical data for generating the representation of individual or aggregate human medical data **1600**. The positioning locator device **1610** provides a reference point and the scope **1615** provides a visual for determining the position of the surgical tool **1620** with reference to the surrounding anatomical structures **1630, 1635**, thereby successfully facilitating the simulated surgery. Since the image of the representation of individual or aggregate human medical data **1600** is an approximate representation of the anatomical structures within the actual patient, surgery may first be simulated on the representation of individual or aggregate human medical data **1600** before performing surgery on the actual patient. By being able to simulate the surgery, medical providers will be able to learn of possible complications and thus anticipate them before performing actual surgery. Surgery simulations may also be performed as a training exercise.

Figure 17 illustrates a flowchart of a method **1700** for generating and displaying a representation of individual or aggregate human medical data, wherein the image of the representation of individual or aggregate human medical data may be used for performing surgery for an exemplary embodiment. The method illustrated in steps **1720** and **1730** in Fig. 17 is identical to the method described above in steps **520** and **530** of Fig. 5. Additionally, at step **1710**, at least one patient medical data of a patient is obtained, wherein at least one patient medical data is obtained from a positioning locator device comprising a scope located within the patient, such that the positioning device provides location information for at least one anatomical structure of the patient with respect to the positioning device. As discussed in Fig. 16, Fig. 16 illustrates a perspective view of a representation of individual or aggregate human medical data **1600** showing a surgical tool **1620** and a positioning locator device **1610** comprising a scope **1615** for an exemplary embodiment. The positioning locator device **1610** may be a GPS locator in an exemplary embodiment. Although the positioning locator device **1610** may be a GPS device, any other positioning locator device may be used without departing

from the scope and spirit of the exemplary embodiment. The scope **1615** may assist in gathering patient medical data for generating the representation of individual or aggregate human medical data **1600**. The positioning locator device **1610** provides a reference point and the scope **1615** provides a visual for determining the position of the surgical tool **1620** with reference to the surrounding anatomical structures **1630, 1635**, thereby successfully facilitating the surgery. During surgery, the medical provider may use and manipulate the representation to assist in making decisions.

At step **1740**, surgery is performed using the image of the representation of individual or aggregate human medical data. Since the image of the representation of individual or aggregate human medical data is an approximate representation of the anatomical structures within the actual patient, surgery may be performed, with assistance from the GPS device with scope located in the patient and shown within the representation of individual or aggregate human medical data. The surgical tool may penetrate the patient during surgery, and the medical provider will be able to see a visual of all the anatomical structures that are in proximity to the surgical tool. The medical provider may be able to view the surgical tool as it moves in close proximity to the anatomical structures. Thus, the medical provider may reduce the risk of surgery complications by reducing the chances of the surgical tool penetrating any of the anatomical structures.

Figure 18 illustrates a flowchart of a method **1800** for generating and displaying a representation of individual or aggregate human medical data, wherein the image of the representation of individual or aggregate human medical data may be used for studying anatomy for an exemplary embodiment. The method illustrated in steps **1810, 1820** and **1830** in Fig. 18 is identical to the method described above in steps **510, 520** and **530** of Fig. 5. Additionally, at step **1840**, the anatomy of a human body may be studied using the image of the representation of individual or aggregate human medical data. Since the image of the representation of individual or aggregate human medical data is an approximate representation of the anatomical structures within the actual patient, students may learn anatomy from the representation of individual or aggregate human medical data, in lieu of only textbooks and/or cadavers.

Figs. 15, 17 and 18 all describe exemplary methods of manipulating the representation of individual or aggregate human medical data for decision making medical purposes. Fig. 15 manipulates the representation for the medical purpose of simulating surgery. Fig. 17 manipulates the representation for the medical purpose of performing surgery. Fig. 18 manipulates the representation for the medical purpose of studying anatomy. However, the representation of individual or aggregate human medical data may be also be manipulated for other medical purposes, such as, but not limited to, treatment and prevention planning, patient education, and research. The medical provider may make decisions based upon the manipulation of the representation.

Referring now to Fig. 19a, in an exemplary embodiment, a GUI **1900** includes an illustration of medical information **1902** for a patient that includes a current numerical value **1904** for a particular medical parameter.

Referring now to Fig. 19b, in an exemplary embodiment, when a mouse pointer icon **1906** is passed over the value **1904**, the value is highlighted by a color coded overlay **1908**, and a GUI **1910** appears proximate the GUI **1900** that includes: a graphical bar illustration **1912** of the upper and lower limits of normal values for the particular medical parameter, a textual illustration **1914** of the lower limit of the normal value for the particular medical parameter positioned proximate a lower end of the graphical illustration **1912**, a textual illustration **1916** of the upper limit of the normal value for the particular medical parameter proximate an upper end of the graphical illustration **1912**, the current numerical value **1918** for the particular medical parameter overlayed onto a color coded shape **1920**, and one or more historical values, **1922**, **1924**, **1926**, **1928**, and **1930**, overlayed onto corresponding color coded shapes, **1932**, **1934**, **1936**, **1938**, and **1940**, respectively.

In an exemplary embodiment, the vertical position of the values, **1918**, **1920**, **1922**, **1924**, **1926**, **1928**, and **1930**, are representative of their relative values. In an exemplary embodiment, the geometry of the shapes, **1920**, **1932**, **1934**, **1936**, **1938**, and **1940**, are representative of the degree to which their value may have been affected by a medical treatment. For example, the shapes, **1934** and **1938**, are elongated relative to the other shapes, **1920**, **1932**, **1936**, and **1940**, to indicate that the corresponding values, **1924** and **1928**, may have been affected by corresponding

medical treatments. In an exemplary embodiment, the corresponding medical treatments are indicated by corresponding textual messages, **1942** and **1944**.

In an exemplary embodiment, the GUI **1902** is connected to the GUI **1910** by a leader line **1946** to indicate that these GUIs are related to one another. In an exemplary embodiment, the elongated shapes, **1934** and **1938**, are connected to the corresponding textual messages, **1942** and **1944**, by corresponding leader lines, **1948** and **1950**, to indicate that these GUI elements are related to one another.

In an exemplary embodiment, the particular medical parameter represented by the value **1904** is serum sodium.

Thus, the GUIs, **1902** and **1910**, illustrated in Figs. 19a and 19b provide a dynamic GUI system that provides a medical professional with an interactive graphical user interface that permits more effective treatment of a patient.

Referring now to Figs. 20 and 21, an exemplary embodiment of a method **2000** for automatic labeling of the aorta in CT abdominal images is provided in which, in **2002**, a CT abdominal scan **2002a** is obtained.

In **2004**, the spine **2004a** is located within the scan **2002a** in a conventional manner.

In **2006**, the location of the spine **2004a** is then used to determine the location of the aorta **2006a** within the scan **2002a** in a conventional manner.

In an exemplary embodiment, the teachings of the method 2000 may be extended to identification of any anatomical structure within a CT scan, or other body image, in which the spine is used as an anchor object for identifying and labeling other anatomical structures.

A computer system has been described that includes a processor; a database that stores a plurality of patient medical data of at least one patient; a virtual patient module that comprises instructions to build a virtual patient that is specific to the at least one patient; and a device to display an image of the virtual patient to a user based upon the plurality of patient medical data. In an exemplary embodiment, the virtual patient is three-dimensional. In an exemplary embodiment, the plurality of

patient medical data of the at least one patient comprises a full body CT scan, and the full body CT scan comprises a plurality of anatomic structures. In an exemplary embodiment, the computer system further includes an anatomical structure detection engine that comprises instructions to recognize at least a portion of the plurality of anatomic structures illustrated in the full body CT scan. In an exemplary embodiment, the instructions recognize at least a portion of the plurality of anatomic structures using density units. In an exemplary embodiment, the density units are Houndsfield units. In an exemplary embodiment, instructions recognize at least a portion of the plurality of anatomic structures using a grid system. In an exemplary embodiment, the instructions to recognize at least a portion of the plurality of anatomic structures comprise instructions for first identifying the location of the spine and then using the identified location of the spine as a reference point for indentifying other anatomic structures. In an exemplary embodiment, the plurality of patient medical data of the at least one patient comprises information from at least one diagnostic test. In an exemplary embodiment, the information comprises at least one image data, the at least one image data comprises a plurality of anatomic structures. In an exemplary embodiment, the computer system further includes an anatomical structure detection engine that comprises instructions to recognize at least a portion of the plurality of anatomic structures illustrated in the at least one image data. In an exemplary embodiment, the instructions to recognize at least a portion of the plurality of anatomic structures is performed via density units. In an exemplary embodiment, the density units are Houndsfield units. In an exemplary embodiment, the instructions to recognize at least a portion of the plurality of anatomic structures is performed via a grid system. In an exemplary embodiment, the instructions to recognize at least a portion of the plurality of anatomic structures comprise instructions for first identifying the location of the spine and then using the identified location of the spine as a reference point for indentifying other anatomic structures. In an exemplary embodiment, the database stores a plurality of patient medical data obtained at various time periods, and wherein the plurality of patient medical data is sortable by the various time periods. In an exemplary embodiment, the image of the virtual patient comprises at least one distinguishable anatomic structure. In an exemplary embodiment, the at least one distinguishable anatomic structure is highlightable. In an exemplary embodiment, the computer system further includes a patient medical data association engine that comprises instructions to associate a

portion of the plurality of patient medical data with the at least one distinguishable anatomic structure. In an exemplary embodiment, the computer system 19, further includes an abnormal patient medical data identification engine that comprises instructions to highlight the at least one distinguishable anatomic structure, wherein at least one associated portion of the plurality of patient medical data falls outside a desired range. In an exemplary embodiment, the desired range is about two standard deviations from a population average. In an exemplary embodiment, the computer system further includes a pointer, wherein the pointer is movable to the at least one distinguishable anatomic structure, such that a portion of the plurality of patient medical data is displayed when the pointer is located upon the at least one distinguishable anatomic structure. In an exemplary embodiment, the plurality of patient medical data that is displayed when the pointer is located upon the at least one distinguishable anatomic structure comprises current and historical medical data. In an exemplary embodiment, the plurality of patient medical data that is displayed when the pointer is located upon the at least one distinguishable anatomic structure comprises one or more medical treatments associated with one or more of the medical data. In an exemplary embodiment, the pointer is further movable to the plurality of patient medical data that is displayed when the pointer is located upon the at least one distinguishable anatomic structure, such that further related patient medical data is displayed when the pointer is located upon the plurality of patient medical data. In an exemplary embodiment, the further related patient medical data comprises current and historical medical data. In an exemplary embodiment, the further related patient medical data comprises one or more medical treatments associated with one or more of the further related medical data. In an exemplary embodiment, the computer system further includes a patient medical data association engine that comprises instructions to associate the portion of the plurality of patient medical data with the at least one distinguishable anatomic structure. In an exemplary embodiment, the portion of the plurality of patient medical data comprises information related to a blood test. In an exemplary embodiment, the portion of the plurality of patient medical data is current information. In an exemplary embodiment, the computer system further includes a pointer, wherein the pointer is movable to the at least one distinguishable anatomic structure, such that a portion of the plurality of patient medical data is accessible when the pointer is located upon the at least one distinguishable anatomic structure. In an exemplary embodiment, the computer

system further includes a patient medical data association engine that comprises instructions to associate the portion of the plurality of patient medical data with the at least one distinguishable anatomic structure. In an exemplary embodiment, the portion of the plurality of patient medical data comprises information from at least one diagnostic test, wherein the at least one diagnostic test is selected from a group consisting of a blood test, an x-ray, a CT scan, a PET scan and a blood test. In an exemplary embodiment, the portion of the plurality of patient medical data comprises current information. In an exemplary embodiment, the portion of the plurality of patient medical data comprises historical information. In an exemplary embodiment, the plurality of patient medical data comprises heredity traits of parents and siblings and diseases of parents and siblings. In an exemplary embodiment, the computer system further includes a best plan of care engine that comprises instructions to provide diagnostic information. In an exemplary embodiment, the computer system further includes a recommended diagnostic test reminder engine that comprises instructions to provide reminders of recommended diagnostic tests based upon the plurality of patient medical data. In an exemplary embodiment, the computer system further includes a communications device for accessing additional patient medical data of the at least one patient, wherein the additional patient medical data is stored at a remote location. In an exemplary embodiment, the computer system further includes a GUI having access to a medical provider portal. In an exemplary embodiment, the medical provider portal comprises a plurality of links, wherein at least one of the plurality of links is selected from a group consisting of a dicom, a molecular data, a tumor specification, an EMR, a demographics, an evidenced based medicine and a best plan of care. In an exemplary embodiment, the best plan of care is determined via a best plan of care engine. In an exemplary embodiment, the GUI has access to a patient portal. In an exemplary embodiment, the patient portal comprises a plurality of links, wherein at least one of the plurality of links is selected from a group consisting of a view my body, an executive CT, a what are my diseases, a what are my risk factors, and a what is best evidence for my treatment. In an exemplary embodiment, the computer system further includes a communications device for accessing a website, wherein the database is accessible via the website, and wherein the database is updatable by a medical provider. In an exemplary embodiment, a plurality of engines are executed from the website.

A computer implemented method has been described that includes obtaining a plurality of patient medical data of a patient; generating a virtual patient using the plurality of patient medical data, wherein the virtual patient is specific to the patient; and displaying an image of the virtual patient on a device for interaction with a user. In an exemplary embodiment, the virtual patient is three-dimensional. In an exemplary embodiment, the plurality of patient medical data comprises a full body CT scan, and the full body CT scan comprises a plurality of anatomic structures. In an exemplary embodiment, generating a virtual patient using the plurality of patient medical data comprises recognizing at least a portion of the plurality of anatomic structures illustrated in the full body CT scan. In an exemplary embodiment, recognizing at least a portion of the plurality of anatomic structures comprises using density units. In an exemplary embodiment, the density units are Houndsfield units. In an exemplary embodiment, recognizing at least a portion of the plurality of anatomic structures comprises using a grid system. In an exemplary embodiment, recognizing at least a portion of the plurality of anatomic structures comprises first identifying the location of the spine and then using the identified location of the spine as a reference point for indentifying other anatomic structures. In an exemplary embodiment, the plurality of patient medical data comprises information from at least one diagnostic test. In an exemplary embodiment, the information comprises at least one image data, the at least one image data comprises a plurality of anatomic structures. In an exemplary embodiment, generating a virtual patient using the plurality of patient medical data comprises recognizing at least a portion of the plurality of anatomic structures illustrated in the at least one image data. In an exemplary embodiment, recognizing at least a portion of the plurality of anatomic structures comprises using density units. In an exemplary embodiment, the density units are Houndsfield units. In an exemplary embodiment, recognizing at least a portion of the plurality of anatomic structures comprises using a grid system. In an exemplary embodiment, recognizing at least a portion of the plurality of anatomic structures comprises first identifying the location of the spine and then using the identified location of the spine as a reference point for indentifying other anatomic structures. In an exemplary embodiment, the plurality of patient medical data is stored in a database. In an exemplary embodiment, the plurality of patient medical data is obtained at various time periods, and wherein the plurality of patient medical data is sortable by the various time periods. In an exemplary embodiment, the image

of the virtual patient comprises at least one distinguishable anatomic structure. In an exemplary embodiment, the at least one distinguishable anatomic structure is highlightable. In an exemplary embodiment, generating a virtual patient using the plurality of patient medical data comprises associating a portion of the plurality of patient medical data with the at least one distinguishable anatomic structure. In an exemplary embodiment, generating a virtual patient using the plurality of patient medical data comprises instructions to highlight the at least one distinguishable anatomic structure, wherein at least one associated portion of the plurality of patient medical data falls outside a desired range. In an exemplary embodiment, the desired range is about two standard deviations from a population average. In an exemplary embodiment, the method further includes moving a pointer to the at least one distinguishable anatomic structure, such that a portion of the plurality of patient medical data is displayed when the pointer is located upon the at least one distinguishable anatomic structure. In an exemplary embodiment, the plurality of patient medical data that is displayed when the pointer is located upon the at least one distinguishable anatomic structure comprises current and historical medical data. In an exemplary embodiment, the plurality of patient medical data that is displayed when the pointer is located upon the at least one distinguishable anatomic structure comprises one or more medical treatments associated with one or more of the medical data. In an exemplary embodiment, the pointer is further movable to the plurality of patient medical data that is displayed when the pointer is located upon the at least one distinguishable anatomic structure, such that further related patient medical data is displayed when the pointer is located upon the plurality of patient medical data. In an exemplary embodiment, the further related patient medical data comprises current and historical medical data. In an exemplary embodiment, the further related patient medical data comprises one or more medical treatments associated with one or more of the further related medical data. In an exemplary embodiment, generating a virtual patient using the plurality of patient medical data comprises associating the plurality of patient medical data with the at least one distinguishable anatomic structure. In an exemplary embodiment, the portion of the plurality of patient medical data comprises information related to a blood test. In an exemplary embodiment, the portion of the plurality of patient medical data is current information. In an exemplary embodiment, the portion of the plurality of patient medical data is historical information. In an exemplary embodiment, the plurality of

patient medical data comprises heredity traits of parents and siblings and diseases of parents and siblings. In an exemplary embodiment, generating a virtual patient using the plurality of patient medical data comprises providing diagnostic information. In an exemplary embodiment, generating a virtual patient using the plurality of patient medical data comprises providing reminders of recommended diagnostic tests based upon the plurality of patient medical data. In an exemplary embodiment, the method further includes accessing additional patient medical data of the at least one patient via a communications device, wherein the additional patient medical data is stored at a remote location. In an exemplary embodiment, wherein displaying an image of the virtual patient on a device for interaction with a user comprises a GUI having access to a medical provider portal. In an exemplary embodiment, the medical provider portal comprises a plurality of links, wherein at least one of the plurality of links is selected from a group consisting of a dicom, a molecular data, a tumor specification, an EMR, a demographics, an evidenced based medicine and a best plan of care. In an exemplary embodiment, the best plan of care is determined via a best plan of care engine. In an exemplary embodiment, the GUI has access to a patient portal. In an exemplary embodiment, the patient portal comprises a plurality of links, wherein at least one of the plurality of links is selected from a group consisting of a view my body, an executive CT, a what are my diseases, a what are my risk factors, and a what is best evidence for my treatment. In an exemplary embodiment, the method further includes accessing a website via a communications device, wherein the plurality of patient medical data is accessible via the website, and wherein the plurality of patient medical data is updatable by a medical provider. In an exemplary embodiment, a plurality of engines are executed from the website. In an exemplary embodiment, the method further includes simulating surgery using the image of the virtual patient. In an exemplary embodiment, a portion of the plurality of patient medical data is obtained from a positioning device comprising a scope located within the patient, such that the positioning device provides location information for a plurality of anatomic structures of the patient with respect to the positioning device. In an exemplary embodiment, the method further includes performing surgery using the image of the virtual patient. In an exemplary embodiment, the positioning device is a GPS device. In an exemplary embodiment, the method further includes studying anatomy using the image of the virtual patient.

A computer database stored in a memory device has been described that includes a plurality of patient medical data of at least one patient, wherein the plurality of patient medical data is used to build a virtual patient that is specific to the patient. In an exemplary embodiment, the plurality of patient medical data comprises an image, wherein the image comprises a plurality of anatomic structures. In an exemplary embodiment, at least a portion of the plurality of anatomic structures are identifiable via density units. In an exemplary embodiment, the database further includes a detailed anatomic data set. In an exemplary embodiment, at least a portion of the plurality of anatomic structures are identifiable via a grid system, wherein the grid system compares the portion of the plurality of anatomic structures to the detailed anatomic data set. In an exemplary embodiment, the plurality of patient medical data is sortable via the plurality of anatomic structures. In an exemplary embodiment, the plurality of patient medical data is sortable via an acquired date. In an exemplary embodiment, the plurality of patient medical data is sortable via a diagnostic scan type. In an exemplary embodiment, the plurality of patient medical data comprises a recommended population data set. In an exemplary embodiment, the plurality of patient medical data comprises heredity traits and diseases of the parents and the siblings of the at least one patient. In an exemplary embodiment, the database is accessible via a network. In an exemplary embodiment, additional patient medical data is updatable by a medical provider having access to the network. In an exemplary embodiment, the database is accessible via a website. In an exemplary embodiment, additional patient medical data is updatable by a medical provider having access to the website.

A computer program has been described that includes instructions for obtaining a plurality of patient medical data of a patient; generating a virtual patient using the plurality of patient medical data, wherein the virtual patient is specific to the patient; and displaying an image of the virtual patient on a device for interaction with a user. In an exemplary embodiment, the virtual patient is three-dimensional. In an exemplary embodiment, the plurality of patient medical data comprises a full body CT scan, wherein the full body CT scan comprises a plurality of anatomic structures. In an exemplary embodiment, generating a virtual patient using the plurality of patient medical data comprises recognizing at least a portion of the plurality of anatomic structures illustrated in the full body CT scan. In an exemplary

embodiment, recognizing at least a portion of the plurality of anatomic structures comprises using density units. In an exemplary embodiment, the density units are Houndsfield units. In an exemplary embodiment, recognizing at least a portion of the plurality of anatomic structures comprises using a grid system. In an exemplary embodiment, recognizing at least a portion of the plurality of anatomic structures comprises first identifying the location of the spine and then using the identified location of the spine as a reference point for indentifying other anatomic structures. In an exemplary embodiment, the plurality of patient medical data comprises information from at least one diagnostic test. In an exemplary embodiment, the information comprises at least one image data, the at least one image data comprises a plurality of anatomic structures. In an exemplary embodiment, generating a virtual patient using the plurality of patient medical data comprises recognizing at least a portion of the plurality of anatomic structures illustrated in the at least one image data. In an exemplary embodiment, recognizing at least a portion of the plurality of anatomic structures comprises using density units. In an exemplary embodiment, the density units are Houndsfield units. In an exemplary embodiment, recognizing at least a portion of the plurality of anatomic structures comprises using a grid system. In an exemplary embodiment, recognizing at least a portion of the plurality of anatomic structures comprises first identifying the location of the spine and then using the identified location of the spine as a reference point for indentifying other anatomic structures. In an exemplary embodiment, the plurality of patient medical data is stored in a database. In an exemplary embodiment, the plurality of patient medical data is obtained at various time periods, and wherein the plurality of patient medical data is sortable by the various time periods. In an exemplary embodiment, the image of the virtual patient comprises at least one distinguishable anatomic structure. In an exemplary embodiment, the at least one distinguishable anatomic structure is highlightable. In an exemplary embodiment, generating a virtual patient using the plurality of patient medical data comprises associating a portion of the plurality of patient medical data with the at least one distinguishable anatomic structure. In an exemplary embodiment, generating a virtual patient using the plurality of patient medical data comprises instructions to highlight the at least one distinguishable anatomic structure, wherein at least one associated portion of the plurality of patient medical data falls outside a desired range. In an exemplary embodiment, the desired range is about two standard deviations from a population

average. In an exemplary embodiment, the computer program further includes instructions for moving a pointer to the at least one distinguishable anatomic structure, such that a portion of the plurality of patient medical data is displayed when the pointer is located upon the at least one distinguishable anatomic structure. In an exemplary embodiment, the plurality of patient medical data that is displayed when the pointer is located upon the at least one distinguishable anatomic structure comprises current and historical medical data. In an exemplary embodiment, the plurality of patient medical data that is displayed when the pointer is located upon the at least one distinguishable anatomic structure comprises one or more medical treatments associated with one or more of the medical data. In an exemplary embodiment, the pointer is further movable to the plurality of patient medical data that is displayed when the pointer is located upon the at least one distinguishable anatomic structure, such that further related patient medical data is displayed when the pointer is located upon the plurality of patient medical data. In an exemplary embodiment, the further related patient medical data comprises current and historical medical data. In an exemplary embodiment, the further related patient medical data comprises one or more medical treatments associated with one or more of the further related medical data. In an exemplary embodiment, generating a virtual patient using the plurality of patient medical data comprises associating the plurality of patient medical data with the at least one distinguishable anatomic structure. In an exemplary embodiment, the portion of the plurality of patient medical data comprises information related to a blood test. In an exemplary embodiment, the portion of the plurality of patient medical data is current information. In an exemplary embodiment, the portion of the plurality of patient medical data is historical information. In an exemplary embodiment, the plurality of patient medical data comprises heredity traits of parents and siblings and diseases of parents and siblings. In an exemplary embodiment, generating a virtual patient using the plurality of patient medical data comprises providing diagnostic information. In an exemplary embodiment, generating a virtual patient using the plurality of patient medical data comprises providing reminders of recommended diagnostic tests based upon the plurality of patient medical data. In an exemplary embodiment, the computer program further includes instructions for accessing additional patient medical data of the at least one patient via a communications device, wherein the additional patient medical data is stored at a remote location. In an exemplary embodiment, displaying an image of the

virtual patient on a device for interaction with a user comprises a GUI having access to a medical provider portal. In an exemplary embodiment, the medical provider portal comprises a plurality of links, wherein at least one of the plurality of links is selected from a group consisting of a dicom, a molecular data, a tumor specification, an EMR, a demographics, an evidenced based medicine and a best plan of care. In an exemplary embodiment, the best plan of care is determined via a best plan of care engine. In an exemplary embodiment, the GUI has access to a patient portal. In an exemplary embodiment, the patient portal comprises a plurality of links, wherein at least one of the plurality of links is selected from a group consisting of a view my body, an executive CT, a what are my diseases, a what are my risk factors, and a what is best evidence for my treatment. In an exemplary embodiment, the computer program further includes instructions for accessing a website via a communications device, wherein the plurality of patient medical data is accessible via the website, and wherein the plurality of patient medical data is updatable by a medical provider. In an exemplary embodiment, the plurality of engines are executed from the website. In an exemplary embodiment, the computer program further includes instructions for simulating surgery using the image of the virtual patient. In an exemplary embodiment, a portion of the plurality of patient medical data is obtained from a positioning device comprising a scope located within the patient, such that the positioning device provides location information for a plurality of anatomic structures of the patient with respect to the positioning device. In an exemplary embodiment, the computer program further includes instructions for performing surgery using the image of the virtual patient. In an exemplary embodiment, the positioning device is a GPS device. In an exemplary embodiment, the computer program further includes instructions for studying anatomy using the image of the virtual patient.

A graphical user interface has been described that includes at least one portal, the portal being associated with a database containing a plurality of patient medical data; a window region to display results; and a menu selection region containing selectable categories, wherein results are associated with each of the selectable categories. In an exemplary embodiment, the portal is a medical provider portal and wherein the selectable categories are selected from a group consisting of dicom, molecular data, tumor specifications, EMR, demographics, evidenced based medicine and best plan of care. In an exemplary embodiment, the medical provider

portal requires a security pass code, wherein the security pass code determines the level of access. In an exemplary embodiment, the portal is a patient portal and wherein the selectable categories are selected from a group consisting of view my body, executive CT, what are my diseases, what are my risk factors and what is the best evidence for my treatment. In an exemplary embodiment, the patient portal requires a security pass code. In an exemplary embodiment, the graphical user interface further includes a first graphical user interface comprising current medical data for a corresponding patient; and a second graphical user interface comprising the current medical data and corresponding historical medical data; wherein the second graphical user interface appears when a pointer is positioned over the current medical data of the first graphical user interface. In an exemplary embodiment, the second graphical user interface further comprises an indication of which of the current and historical medical data that are associated with a corresponding medical treatment.

Although the invention has been described with reference to specific embodiments, these descriptions are not meant to be construed in a limiting sense. Various modifications of the disclosed embodiments, as well as alternative embodiments of the invention will become apparent to persons skilled in the art upon reference to the description of the invention. It should be appreciated by those skilled in the art that the conception and the specific embodiments disclosed may be readily utilized as a basis for modifying or designing other structures for carrying out the same purposes of the invention. It should also be realized by those skilled in the art that such equivalent constructions do not depart from the spirit and scope of the invention as set forth in the appended claims. It is therefore, contemplated that the claims will cover any such modifications or embodiments that fall within the scope of the invention.

WHAT IS CLAIMED IS:

1. A computer system, comprising:

a processor;

a database that stores a plurality of patient medical data of at least one patient;

a virtual patient module that comprises instructions to build a virtual patient that is specific to the at least one patient; and

a device to display an image of the virtual patient to a user based upon the plurality of patient medical data.

2. The computer system of claim 1, wherein the virtual patient is three-dimensional.

3. The computer system of claim 1, wherein the plurality of patient medical data of the at least one patient comprises a full body CT scan, wherein the full body CT scan comprises a plurality of anatomic structures.

4. The computer system of claim 3, further comprising an anatomical structure detection engine that comprises instructions to recognize at least a portion of the plurality of anatomic structures illustrated in the full body CT scan.

5. The computer system of claim 4, wherein the instructions to recognize at least a portion of the plurality of anatomic structures is performed via density units.

6. The computer system of claim 5, wherein the density units are Houndsfield units.

7. The computer system of claim 4, wherein the instructions to recognize at least a portion of the plurality of anatomic structures is performed via a grid system.

8. The computer system of claim 4, wherein the instructions to recognize at least a portion of the plurality of anatomic structures comprise instructions for first identifying the location of the spine and then using the identified location of the spine as a reference point for indentifying other anatomic structures.

9. The computer system of claim 1, wherein the plurality of patient medical data of the at least one patient comprises information from at least one diagnostic test.

10. The computer system of claim 9, wherein the information comprises at least one image data, the at least one image data comprises a plurality of anatomic structures.

11. The computer system of claim 10, further comprising an anatomical structure detection engine that comprises instructions to recognize at least a portion of the plurality of anatomic structures illustrated in the at least one image data.

12. The computer system of claim 11, wherein the instructions to recognize at least a portion of the plurality of anatomic structures is performed via density units.

13. The computer system of claim 12, wherein the density units are Houndsfield units.

14. The computer system of claim 11, wherein the instructions to recognize at least a portion of the plurality of anatomic structures is performed via a grid system.

15. The computer system of claim 11, wherein the instructions to recognize at least a portion of the plurality of anatomic structures comprise instructions for first identifying the location of the spine and then using the identified location of the spine as a reference point for indentifying other anatomic structures.

16. The computer system of claim 1, wherein the database stores a plurality of patient medical data obtained at various time periods, and wherein the plurality of patient medical data is sortable by the various time periods.

17. The computer system of claim 1, wherein the image of the virtual patient comprises at least one distinguishable anatomic structure.

18. The computer system of claim 17, wherein the at least one distinguishable anatomic structure is highlightable.

19. The computer system of claim 18, further comprising a patient medical data association engine that comprises instructions to associate a portion of the plurality of patient medical data with the at least one distinguishable anatomic structure.

20. The computer system of claim 19, further comprising an abnormal patient medical data identification engine that comprises instructions to highlight the at least one distinguishable anatomic structure, wherein at least one associated portion of the plurality of patient medical data falls outside a desired range.

21. The computer system of claim 20, wherein the desired range is about two standard deviations from a population average.

22. The computer system of claim 17, further comprising a pointer, wherein the pointer is movable to the at least one distinguishable anatomic structure, such that a portion of the plurality of patient medical data is displayed when the pointer is located upon the at least one distinguishable anatomic structure.

23. The computer system of claim 22, wherein the plurality of patient medical data that is displayed when the pointer is located upon the at least one distinguishable anatomic structure comprises current and historical medical data.

24. The computer system of claim 23, wherein the plurality of patient medical data that is displayed when the pointer is located upon the at least one distinguishable anatomic structure comprises one or more medical treatments associated with one or more of the medical data.

25. The computer system of claim 22, wherein the pointer is further movable to the plurality of patient medical data that is displayed when the pointer is located upon

the at least one distinguishable anatomic structure, such that further related patient medical data is displayed when the pointer is located upon the plurality of patient medical data.

26. The computer system of claim 25, wherein the further related patient medical data comprises current and historical medical data.

27. The computer system of claim 25, wherein the further related patient medical data comprises one or more medical treatments associated with one or more of the further related medical data.

28. The computer system of claim 22, further comprising a patient medical data association engine that comprises instructions to associate the portion of the plurality of patient medical data with the at least one distinguishable anatomic structure.

29. The computer system of claim 28, wherein the portion of the plurality of patient medical data comprises information related to a blood test.

30. The computer system of claim 22, wherein the portion of the plurality of patient medical data is current information.

31. The computer system of claim 17, further comprising a pointer, wherein the pointer is movable to the at least one distinguishable anatomic structure, such that a portion of the plurality of patient medical data is accessible when the pointer is located upon the at least one distinguishable anatomic structure.

32. The computer system of claim 31, further comprising a patient medical data association engine that comprises instructions to associate the portion of the plurality of patient medical data with the at least one distinguishable anatomic structure.

33. The computer system of claim 32, wherein the portion of the plurality of patient medical data comprises information from at least one diagnostic test, wherein the at least one diagnostic test is selected from a group consisting of a blood test, an x-ray, a CT scan, a PET scan and a blood test.

34. The computer system of claim 31, wherein the portion of the plurality of patient medical data comprises current information.

35. The computer system of claim 31, wherein the portion of the plurality of patient medical data comprises historical information.

36. The computer system of claim 1, wherein the plurality of patient medical data comprises heredity traits of parents and siblings and diseases of parents and siblings.

37. The computer system of claim 36, further comprising a best plan of care engine that comprises instructions to provide diagnostic information.

38. The computer system of claim 36, further comprising a recommended diagnostic test reminder engine that comprises instructions to provide reminders of recommended diagnostic tests based upon the plurality of patient medical data.

39. The computer system of claim 1, further comprising a communications device for accessing additional patient medical data of the at least one patient, wherein the additional patient medical data is stored at a remote location.

40. The computer system of claim 1, further comprising a GUI having access to a medical provider portal.

41. The computer system of claim 40, wherein the medical provider portal comprises a plurality of links, wherein at least one of the plurality of links is selected from a group consisting of a dicom, a molecular data, a tumor specification, an EMR, a demographics, an evidenced based medicine and a best plan of care.

42. The computer system of claim 41, wherein the best plan of care is determined via a best plan of care engine.

43. The computer system of claim 40, wherein the GUI has access to a patient portal.

44. The computer system of claim 43, wherein the patient portal comprises a plurality of links, wherein at least one of the plurality of links is selected from a group consisting of a view my body, an executive CT, a what are my diseases, a what are my risk factors, and a what is best evidence for my treatment.

45. The computer system of claim 1, further comprising a communications device for accessing a website, wherein the database is accessible via the website, and wherein the database is updatable by a medical provider.

46. The computer system of claim 45, wherein a plurality of engines are executed from the website.

47. A computer implemented method, comprising:

obtaining a plurality of patient medical data of a patient;

generating a virtual patient using the plurality of patient medical data, wherein the virtual patient is specific to the patient; and

displaying an image of the virtual patient on a device for interaction with a user.

48. The method of claim 47, wherein the virtual patient is three-dimensional.

49. The method of claim 47, wherein the plurality of patient medical data comprises a full body CT scan, wherein the full body CT scan comprises a plurality of anatomic structures.

50. The method of claim 49, wherein generating a virtual patient using the plurality of patient medical data comprises recognizing at least a portion of the plurality of anatomic structures illustrated in the full body CT scan.

51. The method of claim 50, wherein recognizing at least a portion of the plurality of anatomic structures comprises using density units.

52. The method of claim 51, wherein the density units are Houndsfield units.

53. The method of claim 50, wherein recognizing at least a portion of the plurality of anatomic structures comprises using a grid system.

54. The method of claim 50, wherein recognizing at least a portion of the plurality of anatomic structures comprises first identifying the location of the spine and then using the identified location of the spine as a reference point for indentifying other anatomic structures.

55. The method of claim 47, wherein the plurality of patient medical data comprises information from at least one diagnostic test.

56. The method of claim 55, wherein the information comprises at least one image data, the at least one image data comprises a plurality of anatomic structures.

57. The method of claim 56, wherein generating a virtual patient using the plurality of patient medical data comprises recognizing at least a portion of the plurality of anatomic structures illustrated in the at least one image data.

58. The method of claim 57, wherein recognizing at least a portion of the plurality of anatomic structures comprises using density units.

59. The method of claim 58, wherein the density units are Houndsfield units.

60. The method of claim 57, wherein recognizing at least a portion of the plurality of anatomic structures comprises using a grid system.

61. The method of claim 57, wherein recognizing at least a portion of the plurality of anatomic structures comprises first identifying the location of the spine and then

using the identified location of the spine as a reference point for indentifying other anatomic structures.

62. The method of claim 47, wherein the plurality of patient medical data is stored in a database.

63. The method of claim 62, wherein the plurality of patient medical data is obtained at various time periods, and wherein the plurality of patient medical data is sortable by the various time periods.

64. The method of claim 47, wherein the image of the virtual patient comprises at least one distinguishable anatomic structure.

65. The method of claim 64, wherein the at least one distinguishable anatomic structure is highlightable.

66. The method of claim 65, wherein generating a virtual patient using the plurality of patient medical data comprises associating a portion of the plurality of patient medical data with the at least one distinguishable anatomic structure.

67. The method of claim 66, wherein generating a virtual patient using the plurality of patient medical data comprises instructions to highlight the at least one distinguishable anatomic structure, wherein at least one associated portion of the plurality of patient medical data falls outside a desired range.

68. The method of claim 67, wherein the desired range is about two standard deviations from a population average.

69. The method of claim 64, further comprising moving a pointer to the at least one distinguishable anatomic structure, such that a portion of the plurality of patient medical data is displayed when the pointer is located upon the at least one distinguishable anatomic structure.

70. The method of claim 69, wherein the plurality of patient medical data that is displayed when the pointer is located upon the at least one distinguishable anatomic structure comprises current and historical medical data.

71. The method of claim 70, wherein the plurality of patient medical data that is displayed when the pointer is located upon the at least one distinguishable anatomic structure comprises one or more medical treatments associated with one or more of the medical data.

72. The method of claim 69, wherein the pointer is further movable to the plurality of patient medical data that is displayed when the pointer is located upon the at least one distinguishable anatomic structure, such that further related patient medical data is displayed when the pointer is located upon the plurality of patient medical data.

73. The method of claim 72, wherein the further related patient medical data comprises current and historical medical data.

74. The method of claim 72, wherein the further related patient medical data comprises one or more medical treatments associated with one or more of the further related medical data.

75. The method of claim 69, wherein generating a virtual patient using the plurality of patient medical data comprises associating the plurality of patient medical data with the at least one distinguishable anatomic structure.

76. The method of claim 75, wherein the portion of the plurality of patient medical data comprises information related to a blood test.

77. The method of claim 69, wherein the portion of the plurality of patient medical data is current information.

78. The method of claim 69, wherein the portion of the plurality of patient medical data is historical information.

79. The method of claim 47, wherein the plurality of patient medical data comprises heredity traits of parents and siblings and diseases of parents and siblings.

80. The method of claim 79, wherein generating a virtual patient using the plurality of patient medical data comprises providing diagnostic information.

81. The method of claim 79, wherein generating a virtual patient using the plurality of patient medical data comprises providing reminders of recommended diagnostic tests based upon the plurality of patient medical data.

82. The method of claim 47, further comprising accessing additional patient medical data of the at least one patient via a communications device, wherein the additional patient medical data is stored at a remote location.

83. The method of claim 47, wherein displaying an image of the virtual patient on a device for interaction with a user comprises a GUI having access to a medical provider portal.

84. The method of claim 83, wherein the medical provider portal comprises a plurality of links, wherein at least one of the plurality of links is selected from a group consisting of a dicom, a molecular data, a tumor specification, an EMR, a demographics, an evidenced based medicine and a best plan of care.

85. The method of claim 84, wherein the best plan of care is determined via a best plan of care engine.

86. The method of claim 83, wherein the GUI has access to a patient portal.

87. The method of claim 86, wherein the patient portal comprises a plurality of links, wherein at least one of the plurality of links is selected from a group consisting of a view my body, an executive CT, a what are my diseases, a what are my risk factors, and a what is best evidence for my treatment.

88. The method of claim 47, further comprising accessing a website via a communications device, wherein the plurality of patient medical data is accessible via the website, and wherein the plurality of patient medical data is updatable by a medical provider.

89. The method of claim 88, wherein a plurality of engines are executed from the website.

90. The method of claim 47, further comprising simulating surgery using the image of the virtual patient.

91. The method of claim 47, wherein a portion of the plurality of patient medical data is obtained from a positioning device comprising a scope located within the patient, such that the positioning device provides location information for a plurality of anatomic structures of the patient with respect to the positioning device.

92. The method of claim 91, further comprising performing surgery using the image of the virtual patient.

93. The method of claim 91, wherein the positioning device is a GPS device.

94. The method of claim 47, further comprising studying anatomy using the image of the virtual patient.

95. A computer database stored in a memory device, comprising:

a plurality of patient medical data of at least one patient, wherein the plurality of patient medical data is used to build a virtual patient that is specific to the patient.

96. The database of claim 95, wherein the plurality of patient medical data comprises an image, wherein the image comprises a plurality of anatomic structures.

97. The database of claim 96, wherein at least a portion of the plurality of anatomic structures are identifiable via density units.

98. The database of claim 96, further comprising a detailed anatomic data set.

99. The database of claim 98, wherein at least a portion of the plurality of anatomic structures are identifiable via a grid system, wherein the grid system compares the portion of the plurality of anatomic structures to the detailed anatomic data set.

100. The database of claim 96, wherein the plurality of patient medical data is sortable via the plurality of anatomic structures.

101. The database of claim 96, wherein the plurality of patient medical data is sortable via an acquired date.

102. The database of claim 96, wherein the plurality of patient medical data is sortable via a diagnostic scan type.

103. The database of claim 95, wherein the plurality of patient medical data comprises a recommended population data set.

104. The database of claim 95, wherein the plurality of patient medical data comprises heredity traits and diseases of the parents and the siblings of the at least one patient.

105. The database of claim 95, wherein the database is accessible via a network.

106. The database of claim 105, wherein additional patient medical data is updatable by a medical provider having access to the network.

107. The database of claim 106, wherein the database is accessible via a website.

108. The database of claim 107, wherein additional patient medical data is updatable by a medical provider having access to the website.

109. A computer program, comprising instructions for:

obtaining a plurality of patient medical data of a patient;

generating a virtual patient using the plurality of patient medical data, wherein the virtual patient is specific to the patient; and

displaying an image of the virtual patient on a device for interaction with a user.

110. The computer program of claim 109, wherein the virtual patient is three-dimensional.

111. The computer program of claim 109, wherein the plurality of patient medical data comprises a full body CT scan, wherein the full body CT scan comprises a plurality of anatomic structures.

112. The computer program of claim 111, wherein generating a virtual patient using the plurality of patient medical data comprises recognizing at least a portion of the plurality of anatomic structures illustrated in the full body CT scan.

113. The computer program of claim 112, wherein recognizing at least a portion of the plurality of anatomic structures comprises using density units.

114. The computer program of claim 113, wherein the density units are Houndsfield units.

115. The computer program of claim 112, wherein recognizing at least a portion of the plurality of anatomic structures comprises using a grid system.

116. The computer program of claim 112, wherein recognizing at least a portion of the plurality of anatomic structures comprises first identifying the location of the spine and then using the identified location of the spine as a reference point for indentifying other anatomic structures.

117. The computer program of claim 109, wherein the plurality of patient medical data comprises information from at least one diagnostic test.

118. The computer program of claim 117, wherein the information comprises at least one image data, the at least one image data comprises a plurality of anatomic structures.

119. The computer program of claim 118, wherein generating a virtual patient using the plurality of patient medical data comprises recognizing at least a portion of the plurality of anatomic structures illustrated in the at least one image data.

120. The computer program of claim 119, wherein recognizing at least a portion of the plurality of anatomic structures comprises using density units.

121. The computer program of claim 120, wherein the density units are Houndsfield units.

122. The computer program of claim 119, wherein recognizing at least a portion of the plurality of anatomic structures comprises using a grid system.

123. The computer program of claim 119, wherein recognizing at least a portion of the plurality of anatomic structures comprises first identifying the location of the spine and then using the identified location of the spine as a reference point for indentifying other anatomic structures.

124. The computer program of claim 109, wherein the plurality of patient medical data is stored in a database.

125. The computer program of claim 124, wherein the plurality of patient medical data is obtained at various time periods, and wherein the plurality of patient medical data is sortable by the various time periods.

126. The computer program of claim 109, wherein the image of the virtual patient comprises at least one distinguishable anatomic structure.

127. The computer program of claim 126, wherein the at least one distinguishable anatomic structure is highlightable.

128. The computer program of claim 127, wherein generating a virtual patient using the plurality of patient medical data comprises associating a portion of the plurality of patient medical data with the at least one distinguishable anatomic structure.

129. The computer program of claim 128, wherein generating a virtual patient using the plurality of patient medical data comprises instructions to highlight the at least one distinguishable anatomic structure, wherein at least one associated portion of the plurality of patient medical data falls outside a desired range.

130. The computer program of claim 129, wherein the desired range is about two standard deviations from a population average.

131. The computer program of claim 128, further comprising instructions for moving a pointer to the at least one distinguishable anatomic structure, such that a

portion of the plurality of patient medical data is displayed when the pointer is located upon the at least one distinguishable anatomic structure.

132. The computer program of claim 131, wherein the plurality of patient medical data that is displayed when the pointer is located upon the at least one distinguishable anatomic structure comprises current and historical medical data.

133. The computer program of claim 132, wherein the plurality of patient medical data that is displayed when the pointer is located upon the at least one distinguishable anatomic structure comprises one or more medical treatments associated with one or more of the medical data.

134. The computer program of claim 131, wherein the pointer is further movable to the plurality of patient medical data that is displayed when the pointer is located upon the at least one distinguishable anatomic structure, such that further related patient medical data is displayed when the pointer is located upon the plurality of patient medical data.

135. The computer program of claim 134, wherein the further related patient medical data comprises current and historical medical data.

136. The computer program of claim 134, wherein the further related patient medical data comprises one or more medical treatments associated with one or more of the further related medical data.

137. The computer program of claim 131, wherein generating a virtual patient using the plurality of patient medical data comprises associating the plurality of patient medical data with the at least one distinguishable anatomic structure.

138. The computer program of claim 137, wherein the portion of the plurality of patient medical data comprises information related to a blood test.

139. The computer program of claim 131, wherein the portion of the plurality of patient medical data is current information.

140. The computer program of claim 131, wherein the portion of the plurality of patient medical data is historical information.

141. The computer program of claim 109, wherein the plurality of patient medical data comprises heredity traits of parents and siblings and diseases of parents and siblings.

142. The computer program of claim 141, wherein generating a virtual patient using the plurality of patient medical data comprises providing diagnostic information.

143. The computer program of claim 141, wherein generating a virtual patient using the plurality of patient medical data comprises providing reminders of recommended diagnostic tests based upon the plurality of patient medical data.

144. The computer program of claim 109, further comprising instructions for accessing additional patient medical data of the at least one patient via a communications device, wherein the additional patient medical data is stored at a remote location.

145. The computer program of claim 109, wherein displaying an image of the virtual patient on a device for interaction with a user comprises a GUI having access to a medical provider portal.

146. The computer program of claim 145, wherein the medical provider portal comprises a plurality of links, wherein at least one of the plurality of links is selected from a group consisting of a dicom, a molecular data, a tumor specification, an EMR, a demographics, an evidenced based medicine and a best plan of care.

147. The computer program of claim 146, wherein the best plan of care is determined via a best plan of care engine.

148. The computer program of claim 145, wherein the GUI has access to a patient portal.

149. The computer program of claim 148, wherein the patient portal comprises a plurality of links, wherein at least one of the plurality of links is selected from a group consisting of a view my body, an executive CT, a what are my diseases, a what are my risk factors, and a what is best evidence for my treatment.

150. The computer program of claim 109, further comprising instructions for accessing a website via a communications device, wherein the plurality of patient medical data is accessible via the website, and wherein the plurality of patient medical data is updatable by a medical provider.

151. The computer program of claim 150, wherein a plurality of engines are executed from the website.

152. The computer program of claim 109, further comprising instructions for simulating surgery using the image of the virtual patient.

153. The computer program of claim 109, wherein a portion of the plurality of patient medical data is obtained from a positioning device comprising a scope located within the patient, such that the positioning device provides location information for a plurality of anatomic structures of the patient with respect to the positioning device.

154. The computer program of claim 153, further comprising instructions for performing surgery using the image of the virtual patient.

155. The computer program of claim 153, wherein the positioning device is a GPS device.

156. The computer program of claim 109, further comprising instructions for studying anatomy using the image of the virtual patient.

157. A graphical user interface, comprising:

at least one portal, the portal being associated with a database containing a plurality of patient medical data;

a window region to display results; and

a menu selection region containing selectable categories, wherein results are associated with each of the selectable categories.

158. The graphical user interface of claim 157, wherein the portal is a medical provider portal and wherein the selectable categories are selected from a group consisting of dicom, molecular data, tumor specifications, EMR, demographics, evidenced based medicine and best plan of care.

159. The graphical user interface of claim 158, wherein the medical provider portal requires a security pass code, wherein the security pass code determines the level of access.

160. The graphical user interface of claim 157, wherein the portal is a patient portal and wherein the selectable categories are selected from a group consisting of view my body, executive CT, what are my diseases, what are my risk factors and what is the best evidence for my treatment.

161. The graphical user interface of claim 160, wherein the patient portal requires a security pass code.

162. The graphical user interface of claim 157, further comprising:

a first graphical user interface comprising current medical data for a corresponding patient; and

a second graphical user interface comprising the current medical data and corresponding historical medical data;

wherein the second graphical user interface appears when a pointer is positioned over the current medical data of the first graphical user interface.

163. The graphical user interface of claim 162, wherein the second graphical user interface further comprises:

an indication of which of the current and historical medical data that are associated with a corresponding medical treatment.

FIG. 1

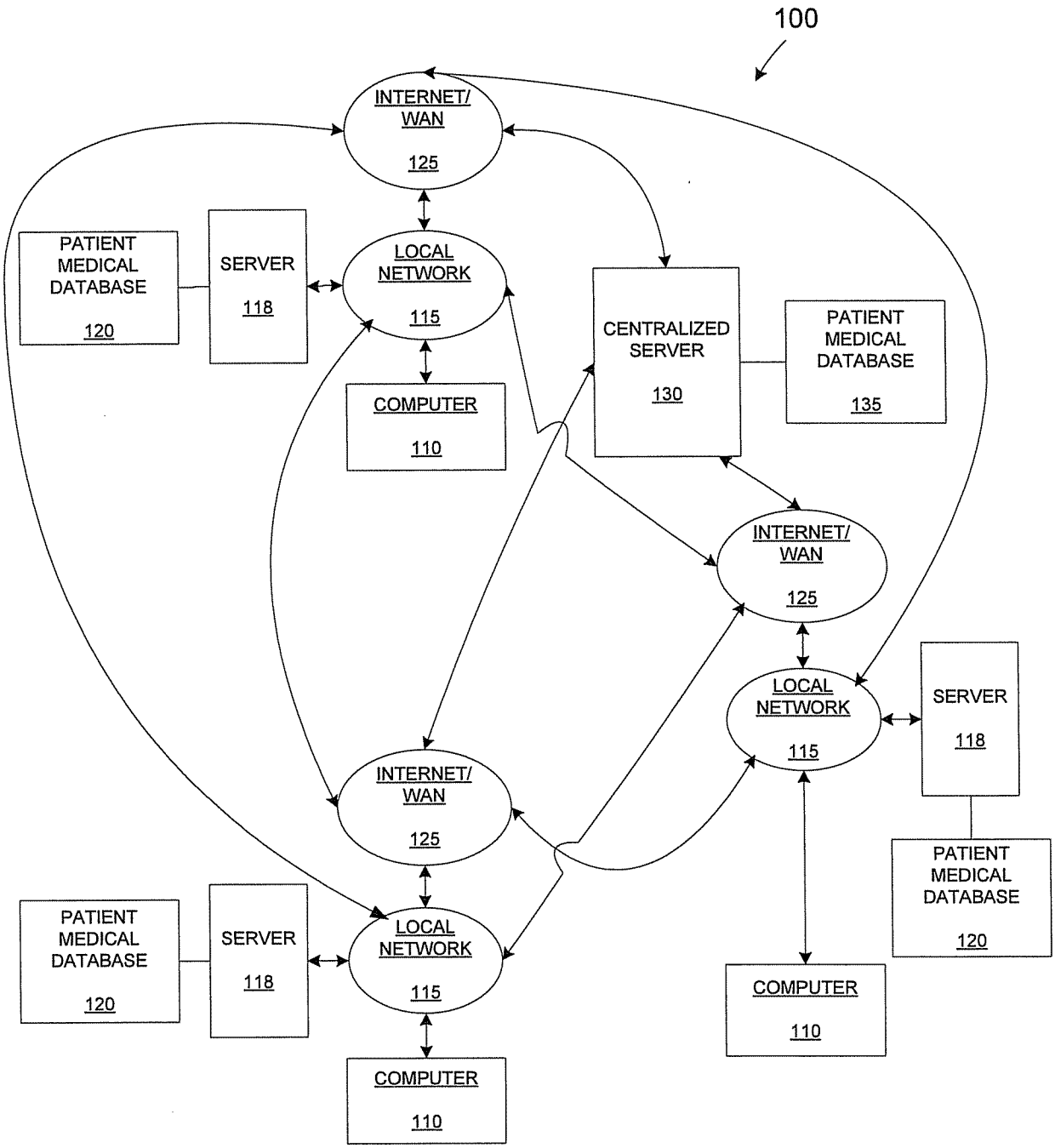
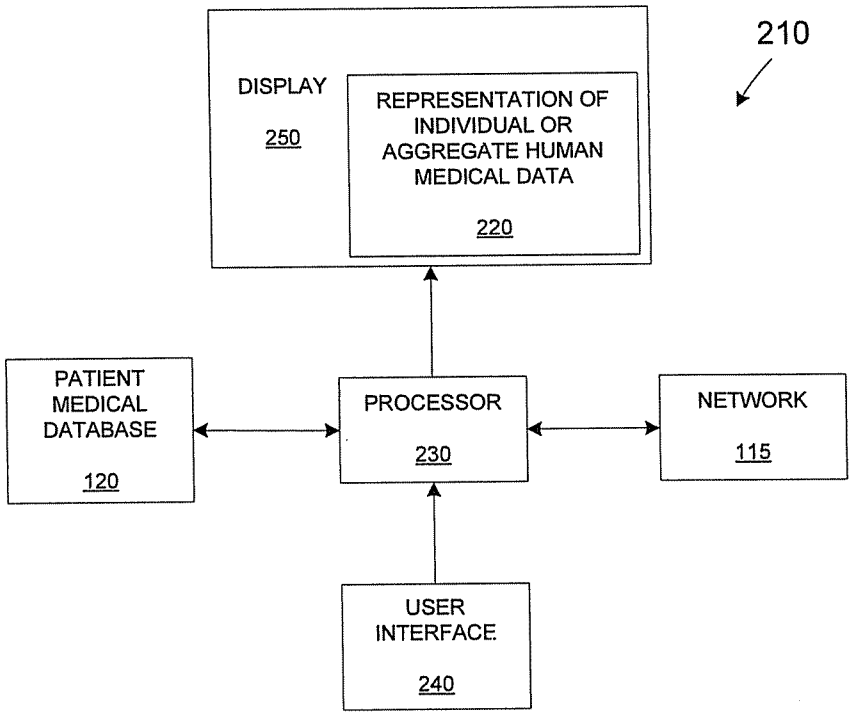

100
INTERNET/ WAN 125
PATIENT MEDICAL DATABASE 120
SERVER 118
LOCAL NETWORK 115
COMPUTER 110
CENTRALIZED SERVER 130
PATIENT MEDICAL DATABASE 135
INTERNET/ WAN 125
LOCAL NETWORK 115
SERVER 118
PATIENT MEDICAL DATABASE 120
INTERNET/ WAN 125
PATIENT MEDICAL DATABASE 120
SERVER 118
LOCAL NETWORK 115
COMPUTER 110
COMPUTER 110

FIG. 2


210
DISPLAY
250
REPRESENTATION OF INDIVIDUAL OR AGGREGATE HUMAN MEDICAL DATA
220
PATIENT MEDICAL DATABASE
120
PROCESSOR
230
NETWORK
115
USER INTERFACE
240

120

PATIENT NAME 315	DATE 320	DATA TYPE 325	PATIENT MEDICAL DATA 310	DIAGNOSTIC SCAN TYPE 330	RELATED ANATOMICAL STRUCTURE 335	ANATOMICAL DATA SET 340	POPULATION MEDICAL DATA 350	POPULATION LOW RANGE 354	POPULATION HIGH RANGE 356	HEREDITY TRAITS 360	RECOMMENDED DIAGNOSTIC TESTS 362
A	5/30/2006	NUMERICAL DATA		BLOOD TEST	AORTA	SPINE	RED BLOOD CELLS	4.7 MILLION/CU MM	6.1 MILLION/CU MM		
A	5/15/2006	NUMERICAL DATA		BLOOD TEST	AORTA	AORTA	HEMOGLOBIN	14 G/100 ML	18 G/100 ML		
A	5/15/2006	IMAGE		CARDIO SCAN	AORTA	BRAIN	MEAN PLATELET VOLUME	7.20%	11.10%		
A	5/15/2006	NUMERICAL DATA		EKG	AORTA	LIVER	PLATELETS	150,000/CU MM	500,000/CU MM		
A	5/7/2006	NUMERICAL DATA		BLOOD TEST	AORTA	LG. INTESTINE	HEMATOCRIT	42%	51%		
A	5/7/2006	IMAGE		CT SCAN (FULL)	ALL PARTS	SM. INTESTINE	WHITE BLOOD CELLS	4.8 THOUSAND CU MM	10.8 THOUSAND CU MM		
A	5/7/2006	NUMERICAL DATA		EKG	AORTA	PANCREA	% LYMPHOCYTES OF WHITE BLOOD CELLS	20%	30%		
A	2/15/2005	IMAGE		CT SCAN (FULL)	ALL PARTS	LEFT KIDNEY	IMMUNOGLOBULINS A	160 MG/DL	260 MG/DL		
A	1/2/2005	IMAGE		X-RAY	RIGHT WRIST, RIGHT HAND	RIGHT KIDNEY	IMMUNOGLOBULINS G	950 MG/DL	1550 MG/DL		
B	5/17/2006	NUMERICAL DATA		BLOOD TEST	AORTA	ESOPHAGUS	IMMUNOGLOBULINS M	50 MG/DL	300 MG/DL		
B	5/17/2006	IMAGE		X-RAY	LEFT KNEE	LEFT HAND					
B	5/1/2006	NUMERICAL DATA		BLOOD TEST	AORTA	RIGHT HAND					
B	5/1/2006	IMAGE		CT SCAN (FULL)	ALL PARTS	LEFT ELBOW					
C	4/20/2006	NUMERICAL DATA		BLOOD TEST	AORTA	RIGHT ELBOW					
C	4/20/2006	IMAGE		CT SCAN (CHEST)	ALL PARTS IN CHEST	LEFT SHOULDER					
C	4/1/2006	IMAGE		PET SCAN (FULL)	ALL PARTS	RIGHT SHOULDER					
C	4/1/2006	IMAGE		X-RAY	LUNGS	LEFT ANKLE					
C	4/1/2006	IMAGE		CT SCAN (FULL)	ALL PARTS	RIGHT ANKLE					
C	4/1/2006	NUMERICAL DATA		BLOOD TEST	AORTA	LEFT KNEE					
C	3/20/2006	IMAGE		X-RAY	LUNGS	RIGHT KNEE					

FIG. 3

FIG. 4

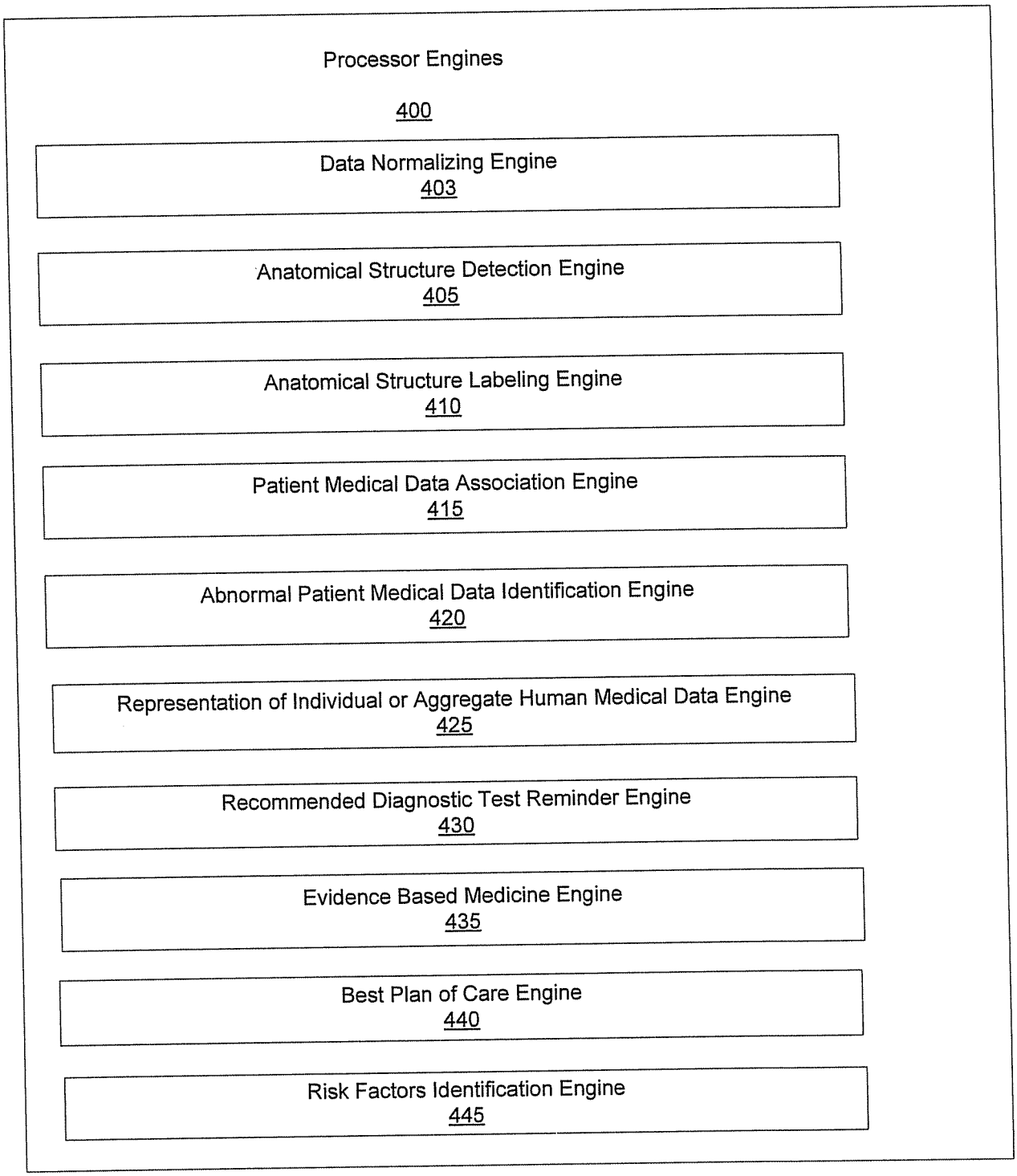

Processor Engines
400
Data Normalizing Engine
403
Anatomical Structure Detection Engine
405
Anatomical Structure Labeling Engine
410
Patient Medical Data Association Engine
415
Abnormal Patient Medical Data Identification Engine
420
Representation of Individual or Aggregate Human Medical Data Engine
425
Recommended Diagnostic Test Reminder Engine
430
Evidence Based Medicine Engine
435
Best Plan of Care Engine
440
Risk Factors Identification Engine
445

FIG. 5

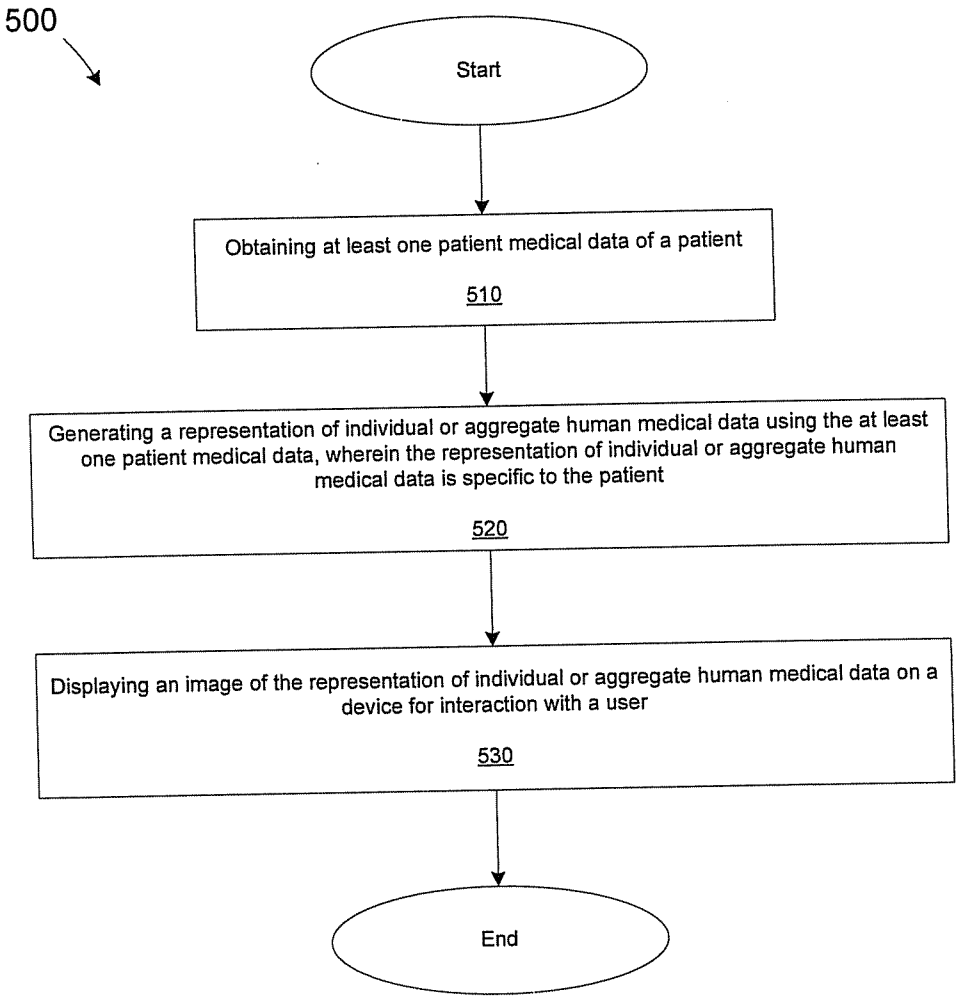

500
Start
Obtaining at least one patient medical data of a patient
510
Generating a representation of individual or aggregate human medical data using the at least one patient medical data, wherein the representation of individual or aggregate human medical data is specific to the patient
520
Displaying an image of the representation of individual or aggregate human medical data on a device for interaction with a user
530
End

Fig. 6A

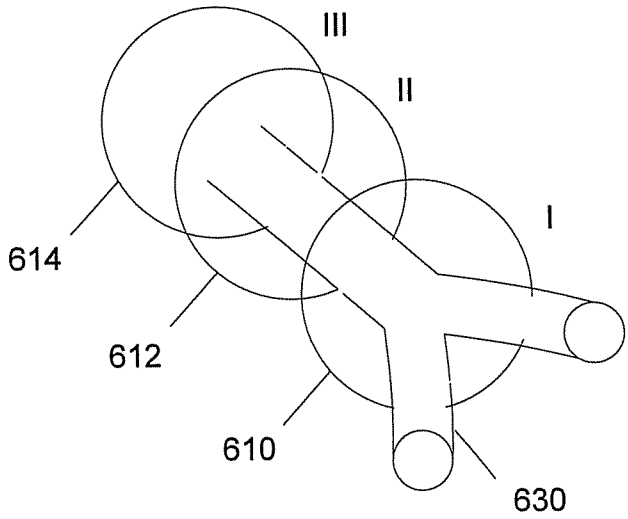


Fig. 6B

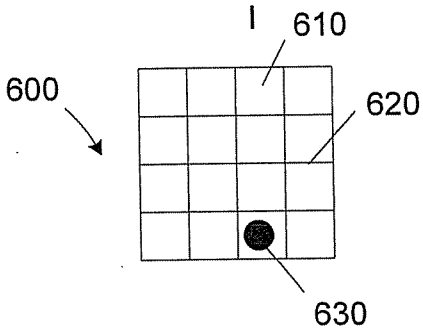


Fig. 6C

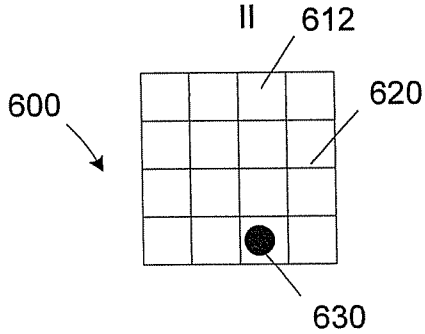


Fig. 6D

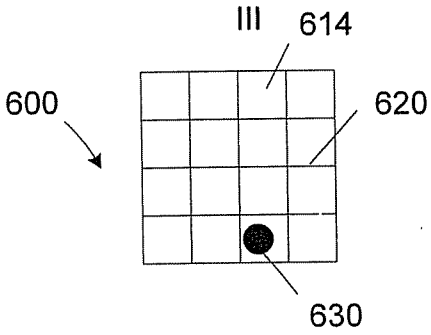


FIG. 7

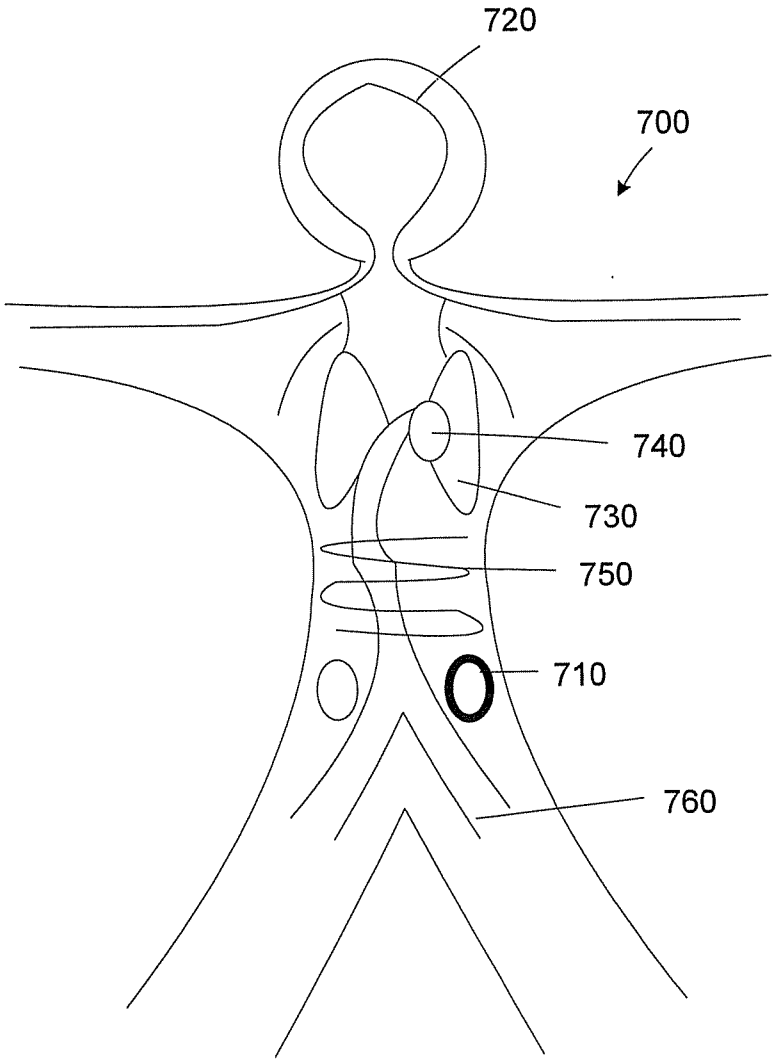


FIG. 8

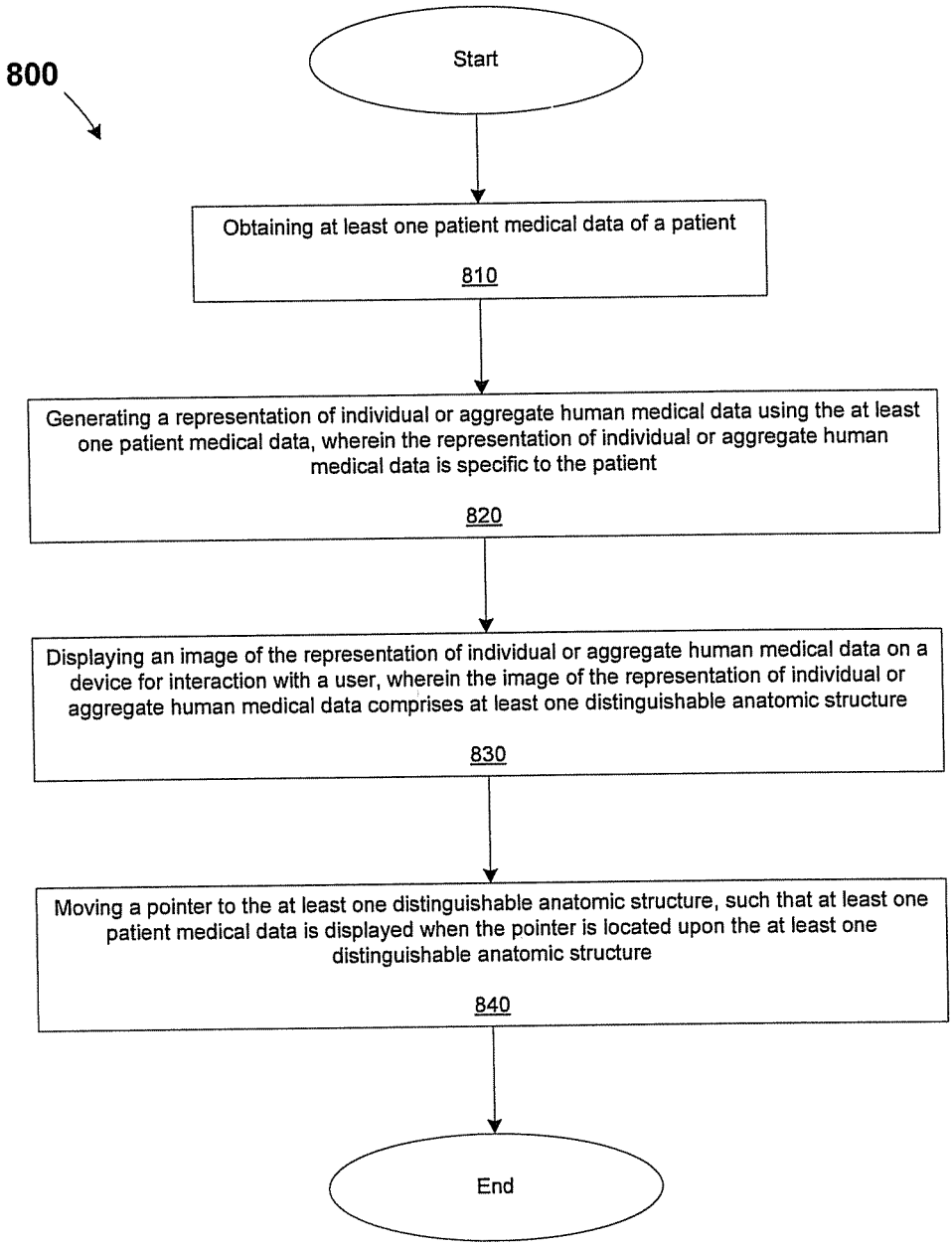

800
Start
Obtaining at least one patient medical data of a patient
810
Generating a representation of individual or aggregate human medical data using the at least one patient medical data, wherein the representation of individual or aggregate human medical data is specific to the patient
820
Displaying an image of the representation of individual or aggregate human medical data on a device for interaction with a user, wherein the image of the representation of individual or aggregate human medical data comprises at least one distinguishable anatomic structure
830
Moving a pointer to the at least one distinguishable anatomic structure, such that at least one patient medical data is displayed when the pointer is located upon the at least one distinguishable anatomic structure
840
End

FIG. 9

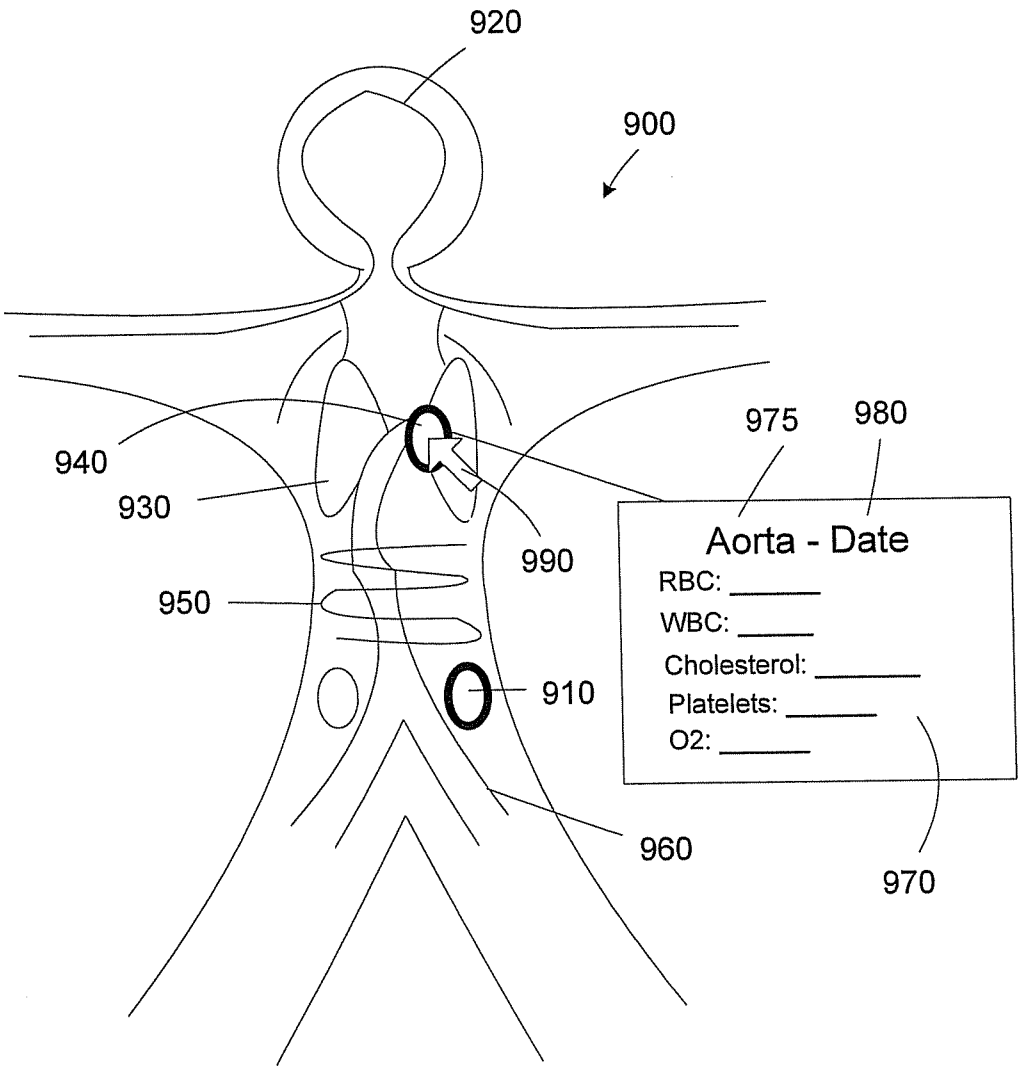

920
900
940
930
990
950
910
960
975
980
Aorta - Date
RBC: _____
WBC: _____
Cholesterol: _____
Platelets: _____
O2: _____
970

FIG. 10

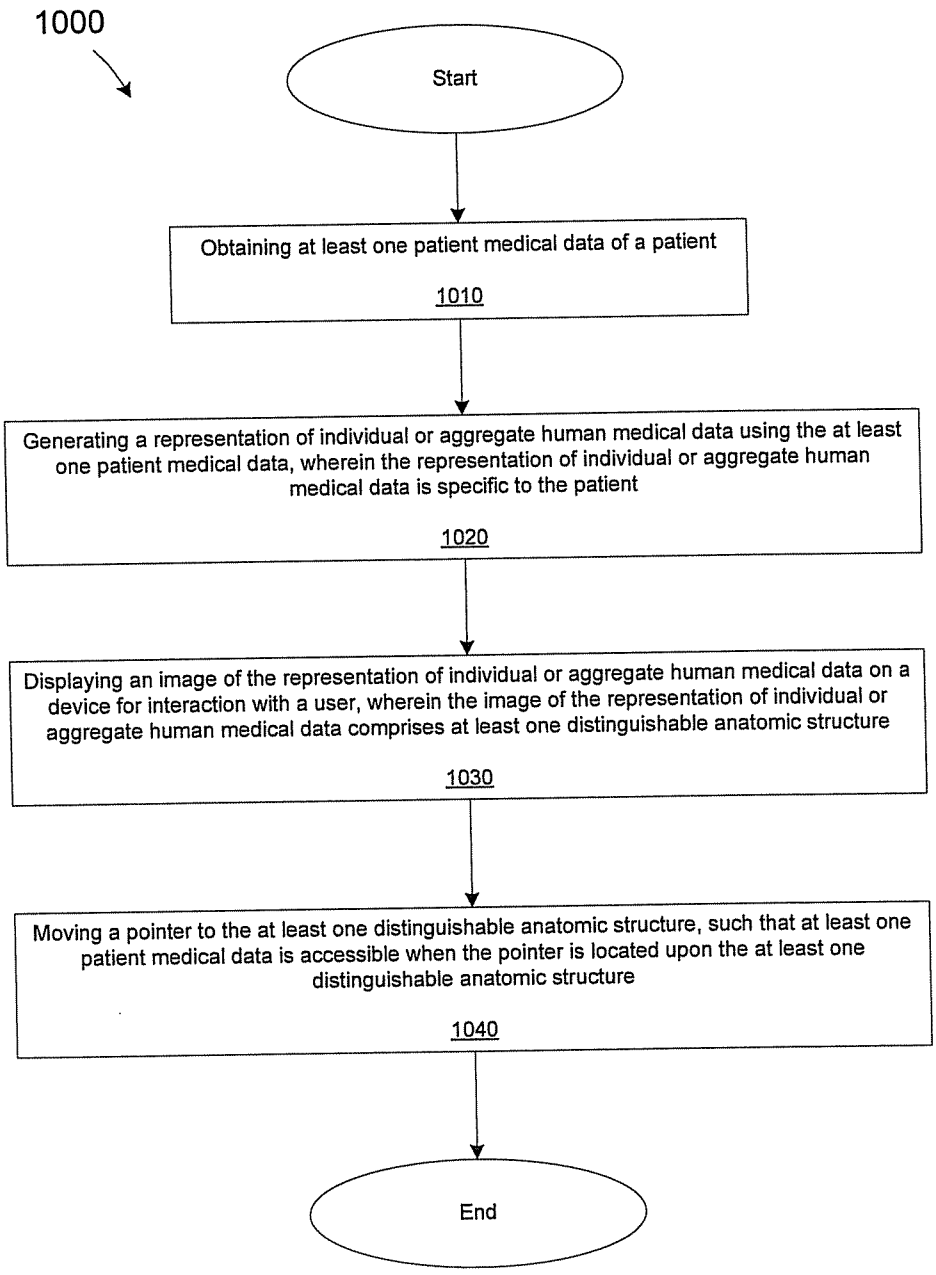

1000
Start
Obtaining at least one patient medical data of a patient
1010
Generating a representation of individual or aggregate human medical data using the at least one patient medical data, wherein the representation of individual or aggregate human medical data is specific to the patient
1020
Displaying an image of the representation of individual or aggregate human medical data on a device for interaction with a user, wherein the image of the representation of individual or aggregate human medical data comprises at least one distinguishable anatomic structure
1030
Moving a pointer to the at least one distinguishable anatomic structure, such that at least one patient medical data is accessible when the pointer is located upon the at least one distinguishable anatomic structure
1040
End

FIG. 11

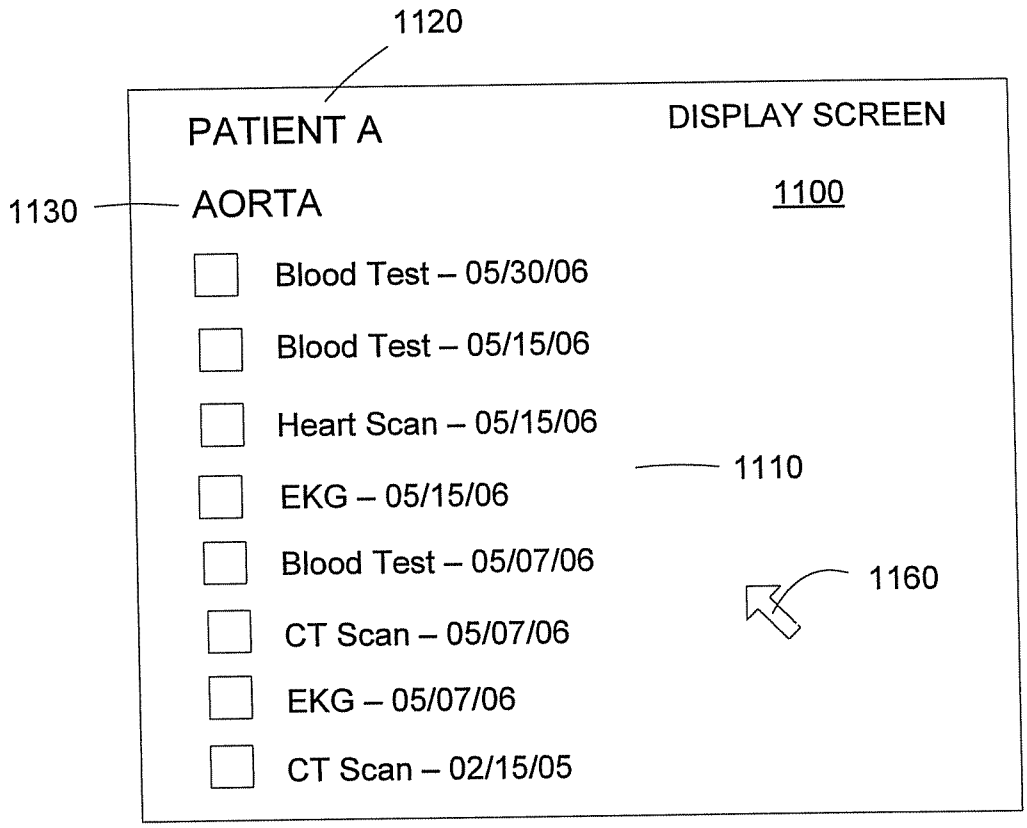

1120
PATIENT A
DISPLAY SCREEN
1100
1130
AORTA
Blood Test – 05/30/06
Blood Test – 05/15/06
Heart Scan – 05/15/06
1110
EKG – 05/15/06
Blood Test – 05/07/06
1160
CT Scan – 05/07/06
EKG – 05/07/06
CT Scan – 02/15/05

FIG. 12

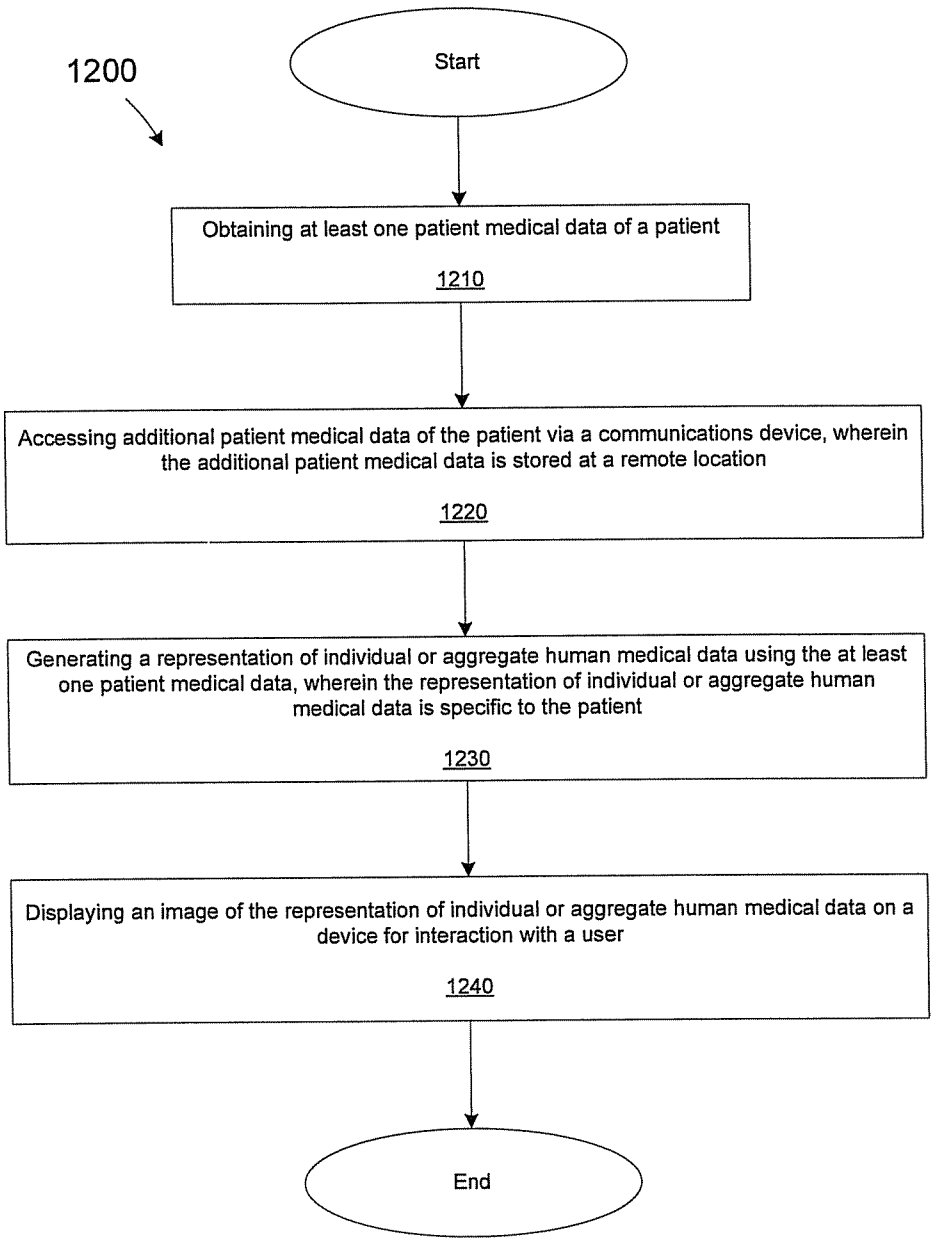

1200
Start
Obtaining at least one patient medical data of a patient
1210
Accessing additional patient medical data of the patient via a communications device, wherein the additional patient medical data is stored at a remote location
1220
Generating a representation of individual or aggregate human medical data using the at least one patient medical data, wherein the representation of individual or aggregate human medical data is specific to the patient
1230
Displaying an image of the representation of individual or aggregate human medical data on a device for interaction with a user
1240
End

FIG. 13

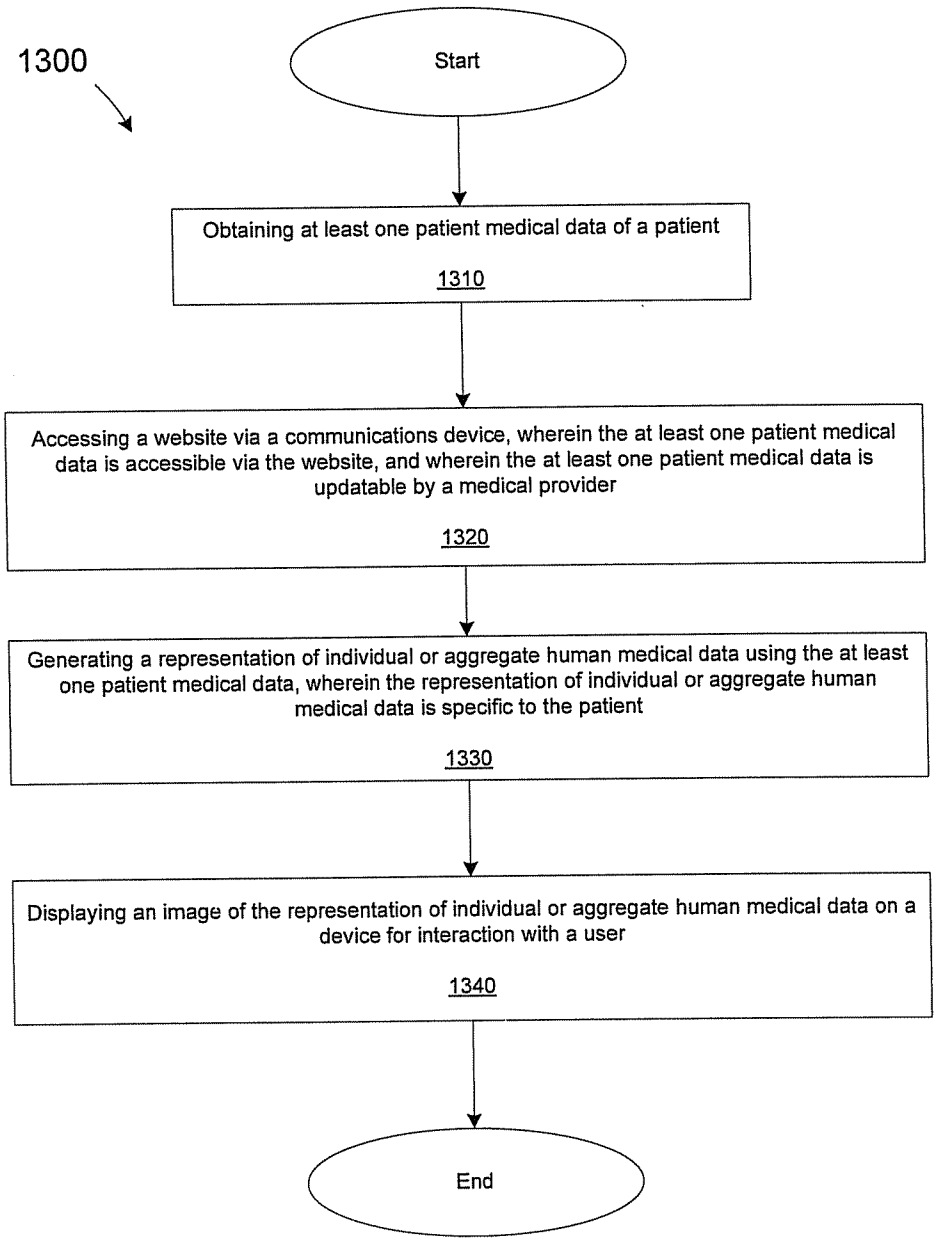

1300
Start
Obtaining at least one patient medical data of a patient
1310
Accessing a website via a communications device, wherein the at least one patient medical data is accessible via the website, and wherein the at least one patient medical data is updatable by a medical provider
1320
Generating a representation of individual or aggregate human medical data using the at least one patient medical data, wherein the representation of individual or aggregate human medical data is specific to the patient
1330
Displaying an image of the representation of individual or aggregate human medical data on a device for interaction with a user
1340
End

FIG. 14A

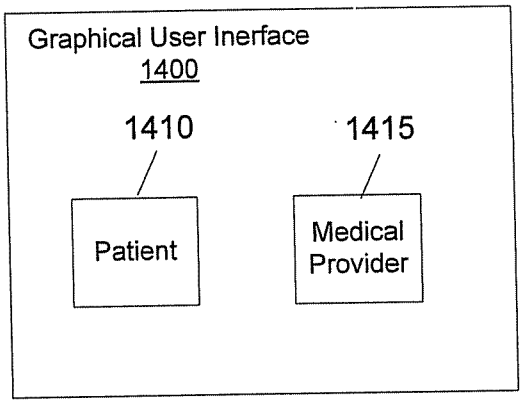


FIG. 14B

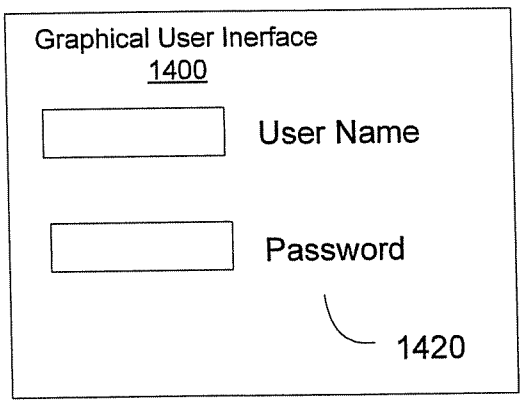


FIG. 14C

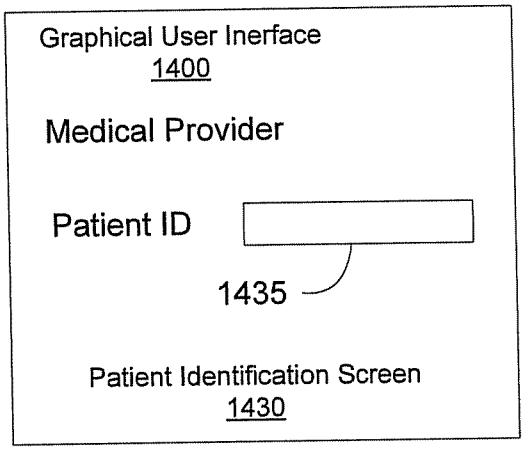


FIG. 14D

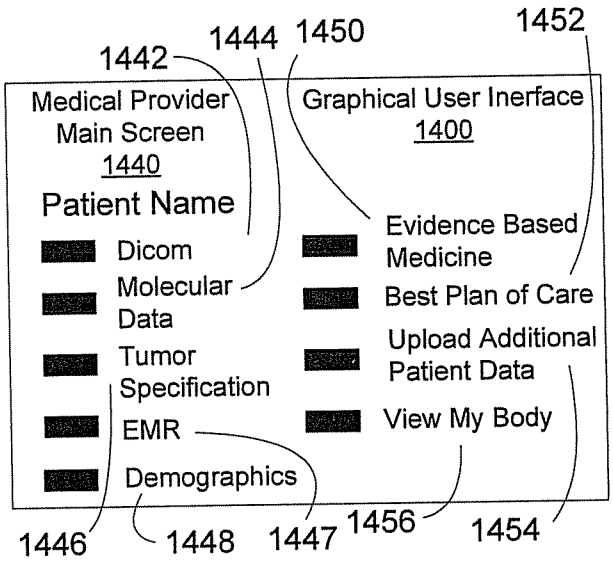


FIG. 14E

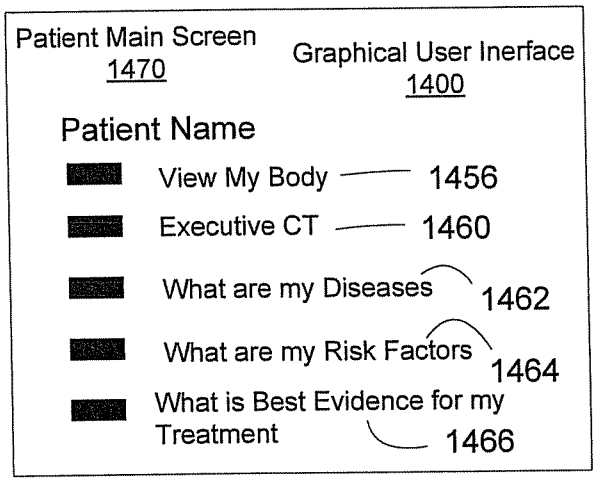


FIG. 15

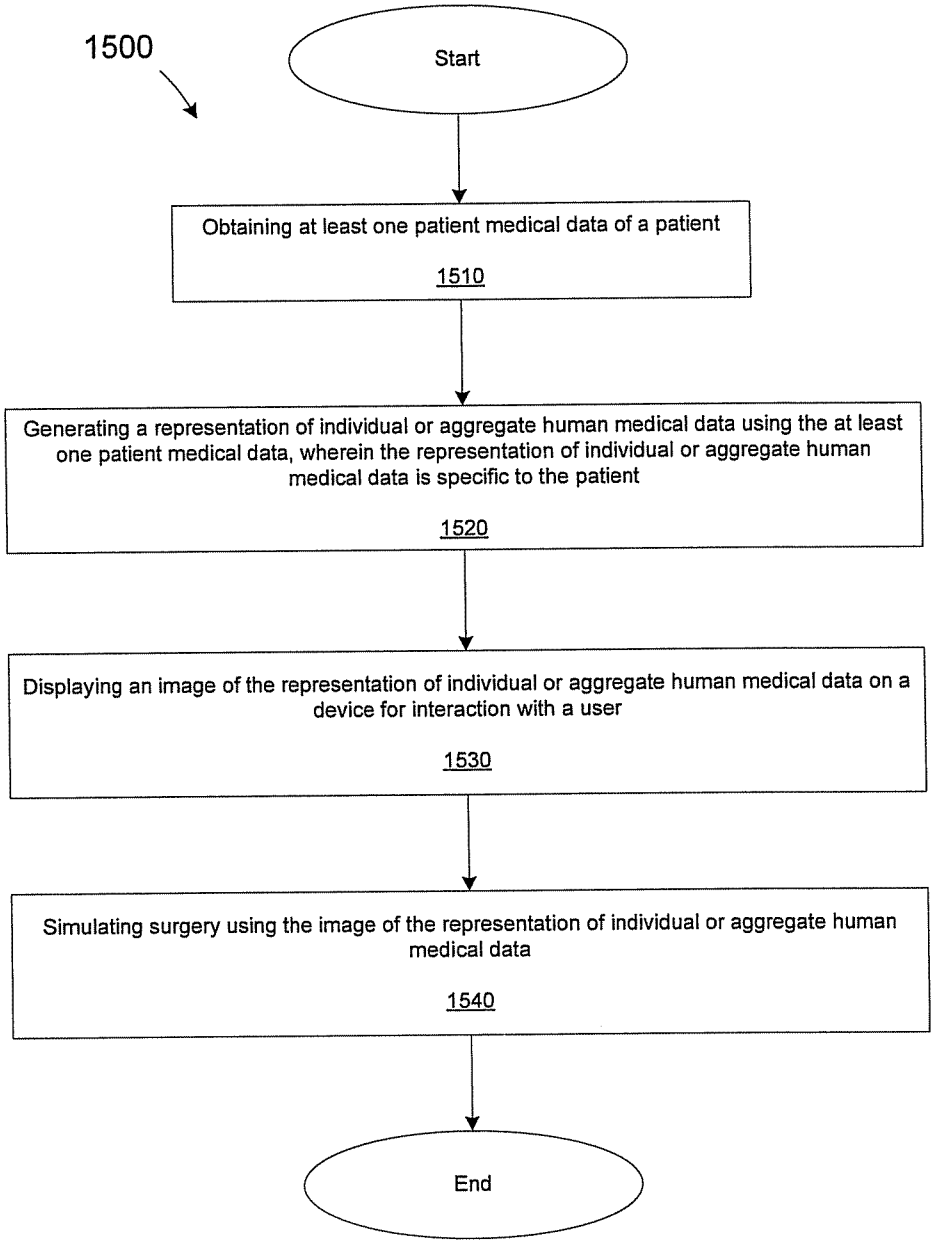

1500
Start
Obtaining at least one patient medical data of a patient
1510
Generating a representation of individual or aggregate human medical data using the at least one patient medical data, wherein the representation of individual or aggregate human medical data is specific to the patient
1520
Displaying an image of the representation of individual or aggregate human medical data on a device for interaction with a user
1530
Simulating surgery using the image of the representation of individual or aggregate human medical data
1540
End

FIG. 16

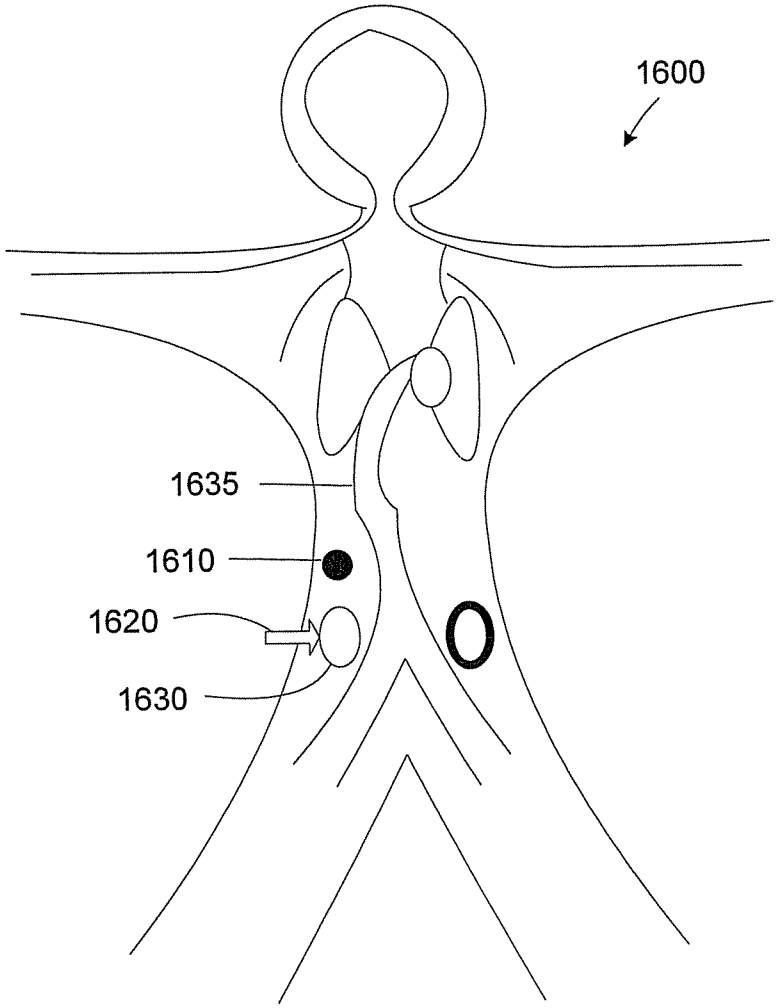


FIG. 17

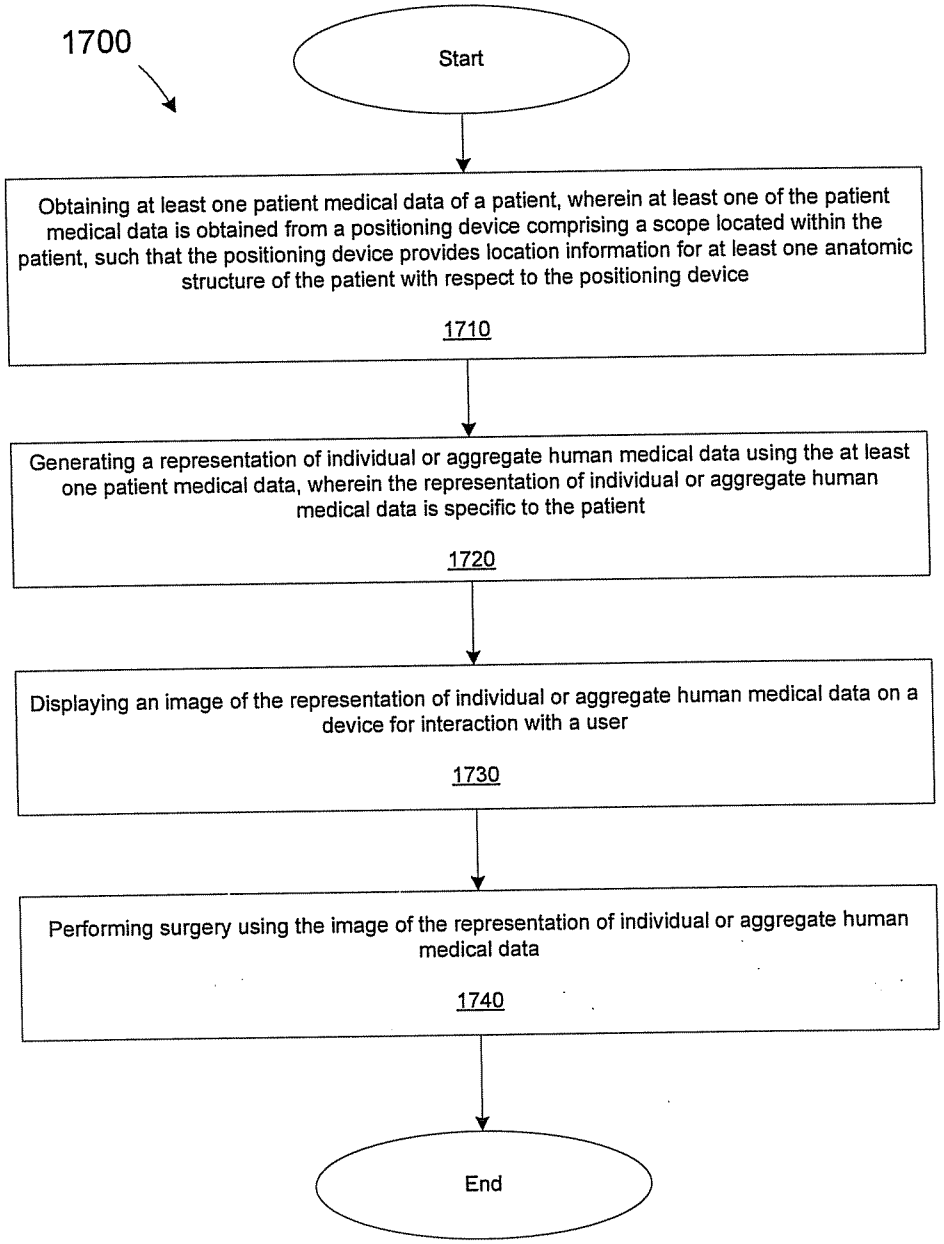
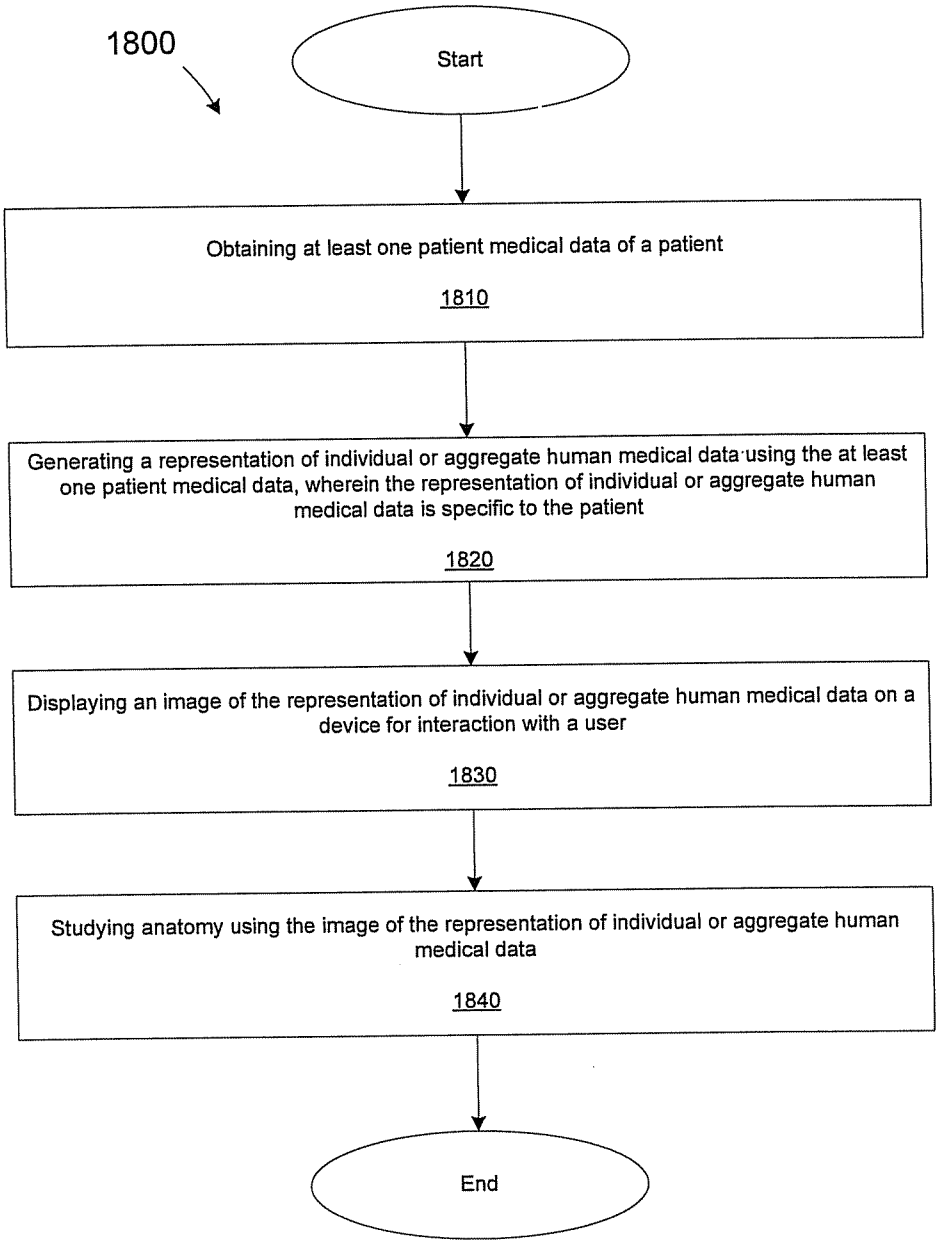

1700
Start
Obtaining at least one patient medical data of a patient, wherein at least one of the patient medical data is obtained from a positioning device comprising a scope located within the patient, such that the positioning device provides location information for at least one anatomic structure of the patient with respect to the positioning device
1710
Generating a representation of individual or aggregate human medical data using the at least one patient medical data, wherein the representation of individual or aggregate human medical data is specific to the patient
1720
Displaying an image of the representation of individual or aggregate human medical data on a device for interaction with a user
1730
Performing surgery using the image of the representation of individual or aggregate human medical data
1740
End

FIG. 18


1800
Start
Obtaining at least one patient medical data of a patient
1810
Generating a representation of individual or aggregate human medical data using the at least one patient medical data, wherein the representation of individual or aggregate human medical data is specific to the patient
1820
Displaying an image of the representation of individual or aggregate human medical data on a device for interaction with a user
1830
Studying anatomy using the image of the representation of individual or aggregate human medical data
1840
End

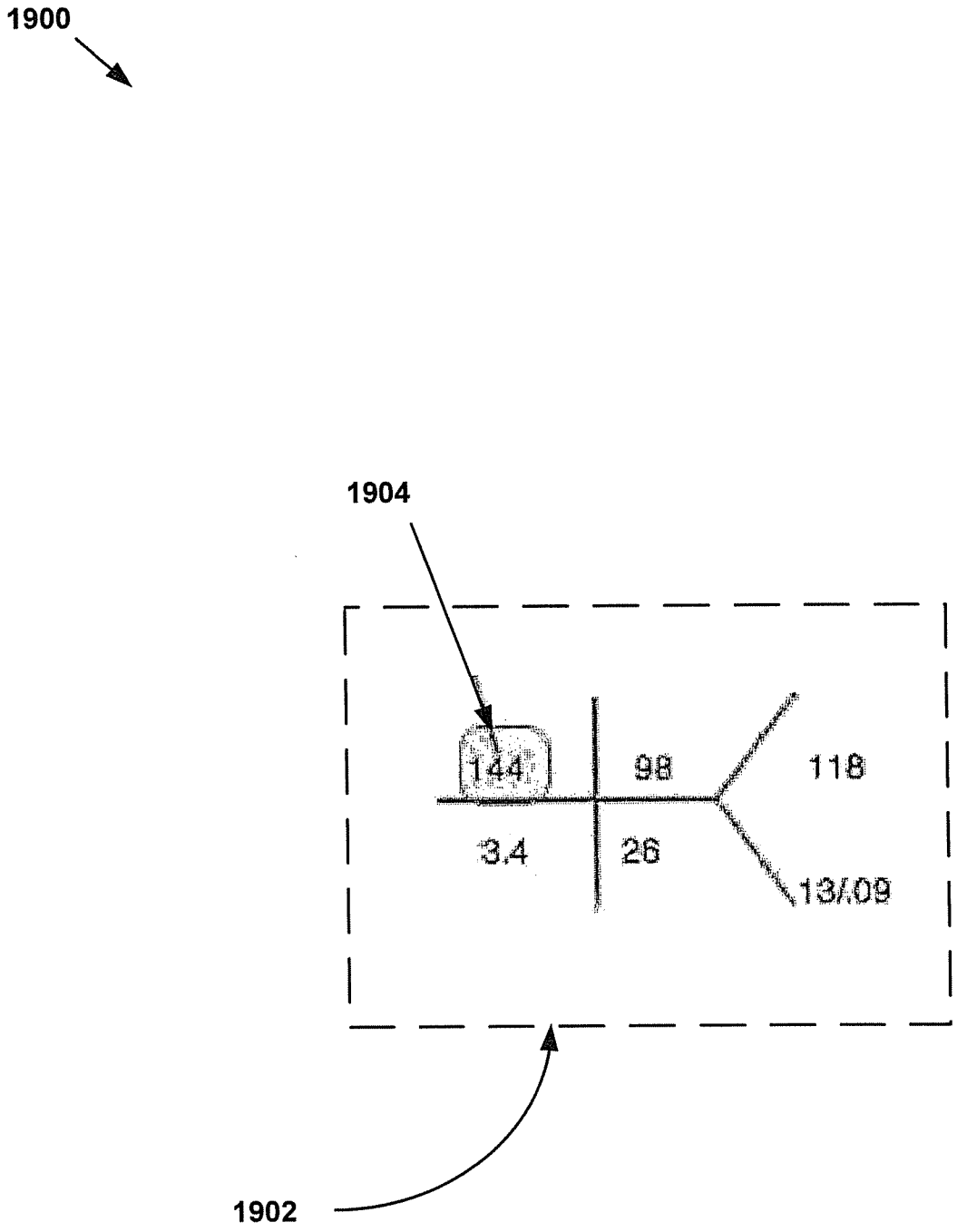


Fig. 19a

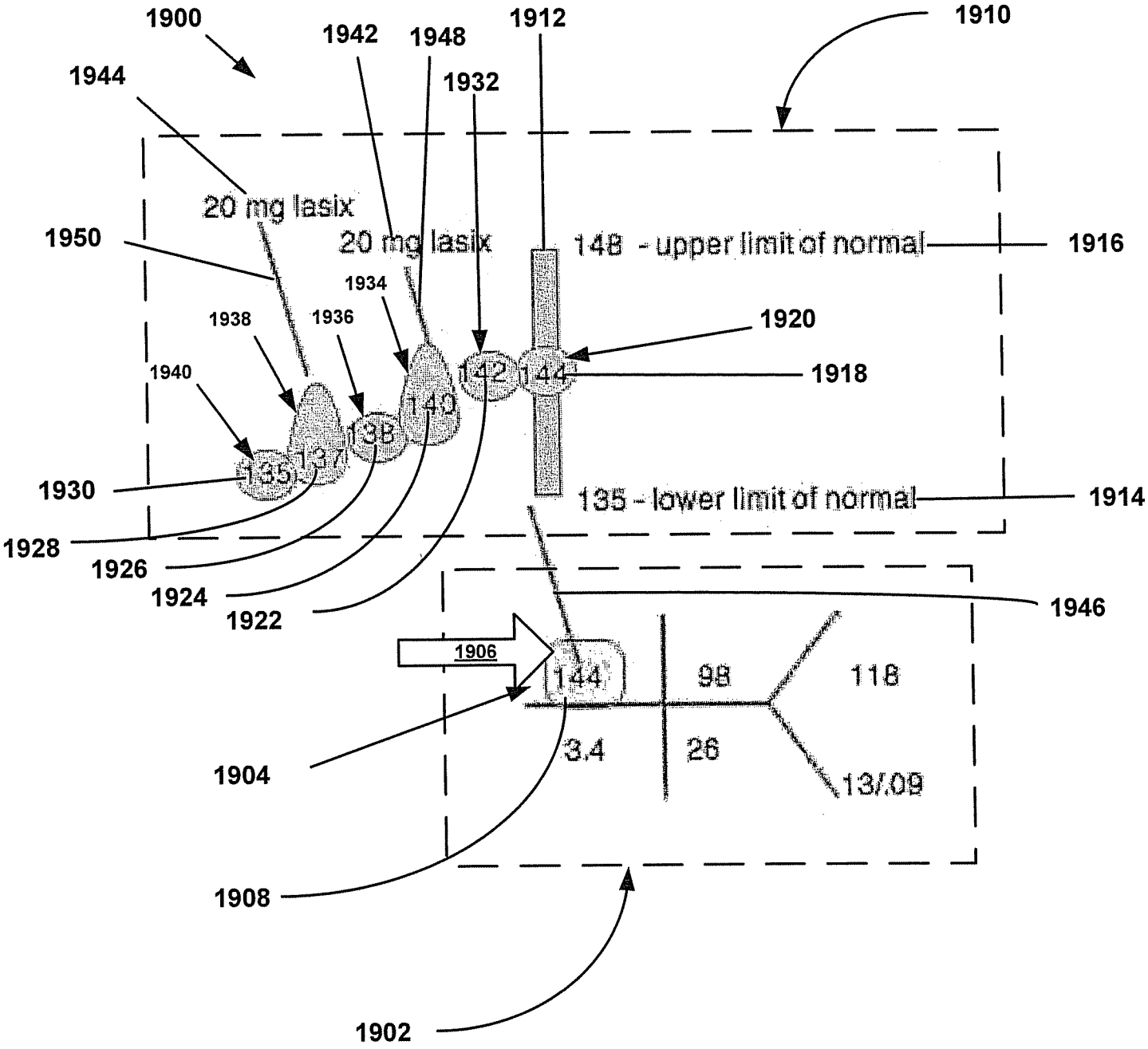

1900
1942
1948
1912
1910
1944
1932
20 mg lasix
20 mg lasix
148 - upper limit of normal
1916
1950
1934
1938
1936
1920
1940
142
144
1918
140
138
135
137
1930
135 - lower limit of normal
1914
1928
1926
1924
1922
1946
1906
144
98
118
3.4
26
13/.09
1904
1908
1902

Fig. 19b

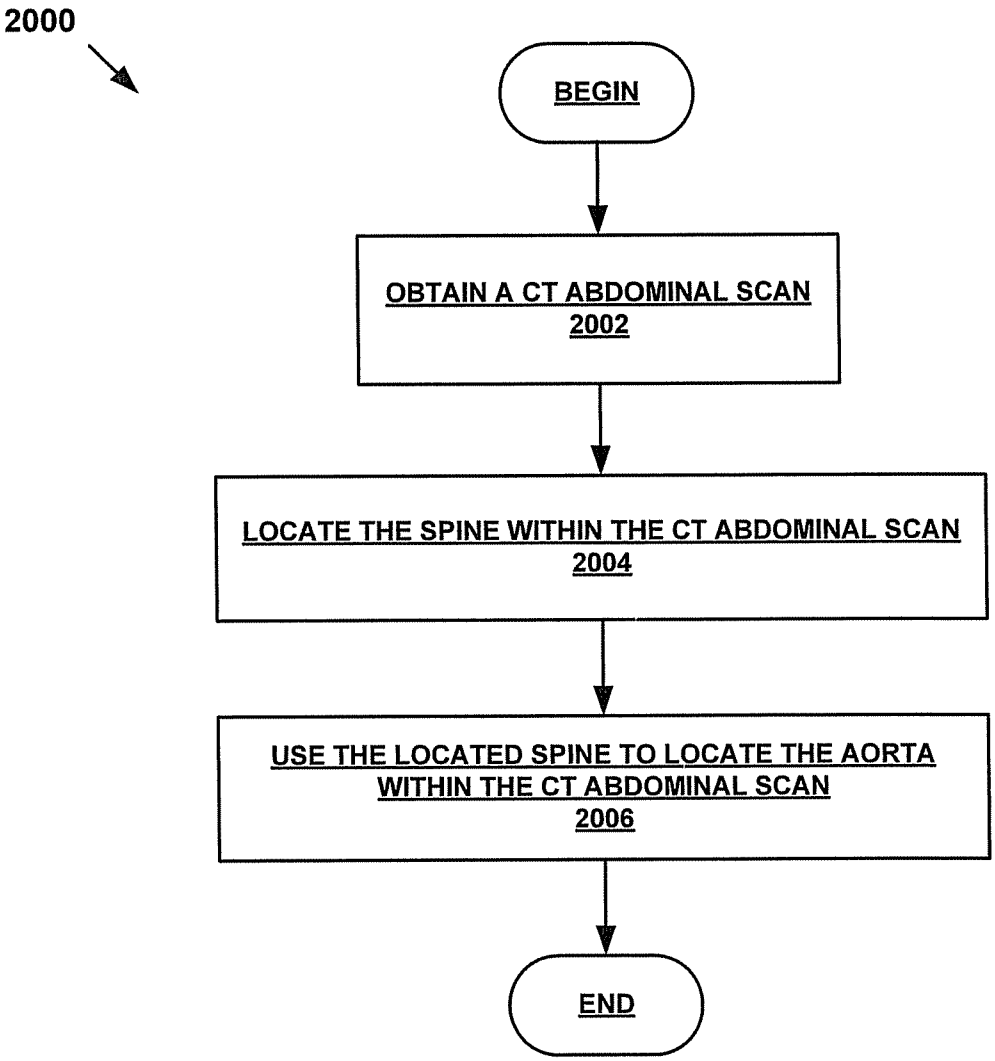

2000
BEGIN
OBTAIN A CT ABDOMINAL SCAN
2002
LOCATE THE SPINE WITHIN THE CT ABDOMINAL SCAN
2004
USE THE LOCATED SPINE TO LOCATE THE AORTA
WITHIN THE CT ABDOMINAL SCAN
2006
END

Fig. 20

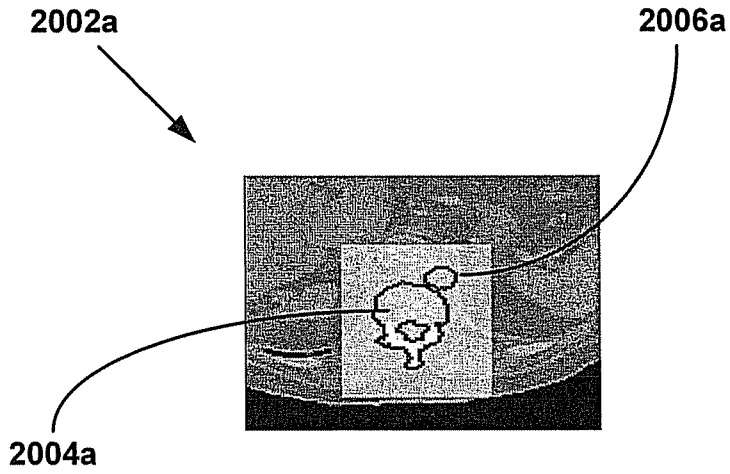


Fig. 21

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 08/77046

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - G06Q 10/00 (2008.04)
USPC - 705/2
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
USPC: 705/2

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 705/2 (keyword limited - see terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWEST(USPT,PGPB,EPAB,JPAB); DialogPRO(Patents);Google Scholar
Search Terms: medical data, virtual patient, computer system, patient data, three-dimensional, CT scan, anatomic structures, density units, Houndsfield units, grid system, diagnostic test, standard deviation, blood test, historical information

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 2007/0061393 A1 (Moore) 15 March 2007 (15.03.2007), entire document especially para [0604], [0067], [0130], [0182], [0205], [0211], [0222], [0248], [0253], [0349]-[0355], [0586], [0592], [0593], [0594], [0595], [0597], [0598], [0604], [0606]-[0610], [0615], [0616], [0631], [0666], [0712], [0725], [0911]-[0921], [0926]-[0936], [0942]-[0951], [0958]-[0999], [1000]-[1001], [1014], [1030], [1050]-[1053], [1072], [1077], [1078], [1081], [1082].	95-108,157-163 --- 1-94,109-156
Y	US 2007/0081712 A1 (Huang et al.) 12 April 2007 (12.04.2007), entire document especially para [0007], [0015], [0061], [0066], [0071], [0072], [0088], [0103], [0129], [0145], [0146].	1-94,109-156
Y	WO 2007/100262 A1 (Brekken et al.) 07 September 2007 (07.09.2007), entire document especially pg 4, para 4; pg 5, para 1,5,6,7; pg 6, para 1,2,3,4,6; pg 7, para 1.	1-94,109-156

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 November 2008 (07.11.2008)	04 DEC 2008
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (April 2007)